AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

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ENTERED AT POST OFFICE, NEW YORK, AS SECOND CLASS MATTER.

14-20-Foot Boring and Turning Mill.

We illustrate herewith a new boring and turning mill recently brought out by the Niles Tool Works, of Hamilton, Ohio.

This machine has been designed to meet the wants of shops whose occasional needs require a machine to turn work of 20′ diameter or more. For the ordinary requirements of these shops a mill to swing 14′ is ample; but at the same time it is important, when the need arises, that they can operate on much larger work. The purchase of a mill 20′ swing involves a very large outlay—too large an investment in one machine for the amount of work there is to do. Constructed as this mill is, the additional investment to enable it to operate on large work is but little greater than the necessary investment in a 14′ mill, and hence does not tie up a large amount of money for machinery to meet an occasional want.

This mill is a 14′ boring and turning mill, provided with extension bed-plate, and power apparatus for moving the housings and entire upper works back, so as to take in work over 14′ diameter. The mill is well arranged for this purpose. All the movements required are made by power, and the changes from 14′ to 20′ can be made very quickly. The mill is made strong and substantial, and has ample power to carry two good cuts at the extreme swing of 20′. The extension bed-plate can be made for any required swing; 20 feet, however, is as large as is usually required.

The machine, as illustrated, is built to take in work 5′ high, but this height can be increased, if desired, mills having been built to take in work 10′ high; table is 10′ diameter. The driving cone has nine steps and is strongly back-geared, affording eighteen changes of speed. The boring bars have 48″ traverse. They are counter-weighted and have quick return. The bars are counter-weighted by a single weight, arranged so that the strain is always directly through the axis of the bar. This device is peculiar to and is an important feature of the Niles mills. The bars are easily and quickly handled, and undue wear in the bearings prevented. Each head has quick hand-traverse by rack and pinion. The bars may be set over to operate at any angle; they are brought exactly to the center of the mill, so that double-end cutters may be used for boring. The feeds are operated through an improved friction disk; the feeds have a wide range, and may be changed instantly through any degree from zero to their limit.

The table is very heavy, and is driven by heavy spur gearing cut from the solid. It is free from lifting, chattering tendencies. The table is provided with a heavy spindle of considerable length. The spindle runs in bearings adjustable for wear, and is carried at the bottom by a steel step, adjustable in height by the small screw head seen at the front of the base.

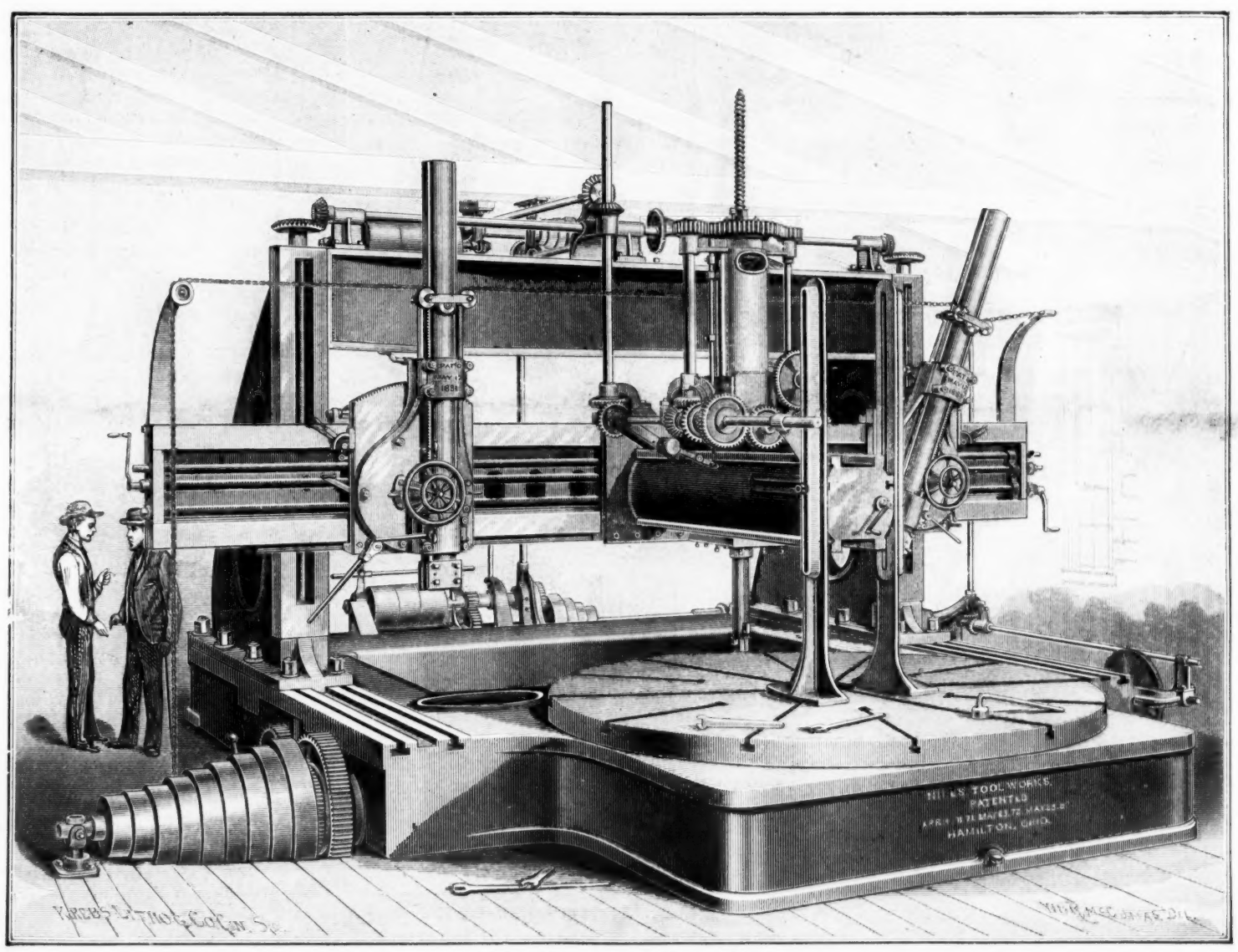
When the weight of the parts is thus carried by the step, the machine moves freely but solidly, and is thus used for the lighter kinds of work. There is an annular bearing under the outer edge of the table, and, when very heavy pieces are to be worked, the step is relieved and the table allowed to seat upon this outer bearing. Thus adjusted, the machine works with all the steadiness of a heavy planer, and with the precision of the lathe.

Heretofore the difficulty in mills of this kind has been the lack of facilities for boring, when the upper works are moved back to take in work larger than the ordinary swing of the mill. For this purpose, a very efficient attachment to this machine has been devised, by means of which the boring may be done while turning; the device can also be used for key-seating.

It consists of a rail attached to the center of the cross-slide of the mill, carrying a head with boring spindle. This attachment is driven independently of the mill itself; consequently, the table of the mill can be run at the proper speed for turning large diameter, and at the same time the boring spindle can be driven at the proper speed for boring simultaneously. The boring head can be brought close up to the cross-slide of the mill, so that it can be used on all diameters. The boring and key-seating attachment is provided with the necessary feeds, operated by power, and every appliance to make a complete machine. It has ample power for boring holes up to 20′ diameter.

A boring and turning mill arranged in this manner is capable of a very wide range of work. The great range of work that a boring and turning mill is capable of performing is not fully appreciated by some who are not sufficiently familiar with its uses. Many are deterred from considering the purchase of these machines, looking upon them as involving a heavy investment upon a tool not often used. As a matter of fact, the boring mill seldom stands still. A 12′ mill will work on small work, of the kind to which it is adapted, to such an advantage over a lathe as to justify its use, regardless of the large work of which it is capable. Numerous small pieces bolted to its remarkably convenient table can be simultaneously faced off with great facility.

Almost anything that a lathe can do, and much that it cannot do, can be done on these boring mills, and often in a much shorter time and in a more satisfactory manner.

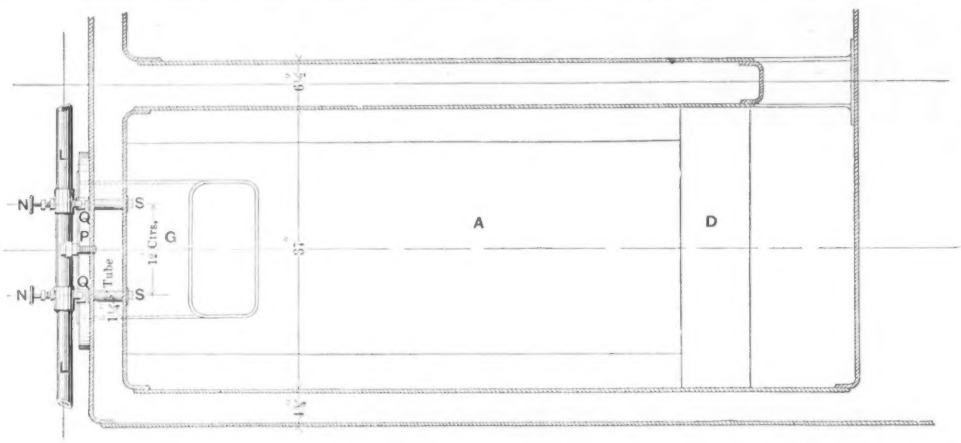


14-20-FOOT BORING AND TURNING MILL.

The time gained in the mere matter of setting unwieldy and irregularly-shaped pieces will alone foot up to a handsome profit in favor of these machines. Every machinist is acquainted with the annoyance of fastening work of this class to a vertical face-plate, and, should an account of this expense (from loss of time and extra help) be kept, it would far exceed the usual estimate.

Branch offices of the Niles Tool Works are at 713 Chestnut street, Philadelphia, and in Gaff Building, Chicago.

A correspondent, writing to a contemporary, gives particulars of the highest speeds attained by various express trains on the different lines from 1878 to 1885; and he states that on April 30, while traveling on the Great Northern by the 2 P. M. express Manchester to London, the express attained a speed of 72 miles per hour whilst running between the ninety-fourth and ninety-second mile-posts from London, and he believes that this speed has never been beaten by any other company. We should think not, for surely this rate is sufficient for all practical requirements, even in these days of rapid and constant changes.—*London Railway Review.*



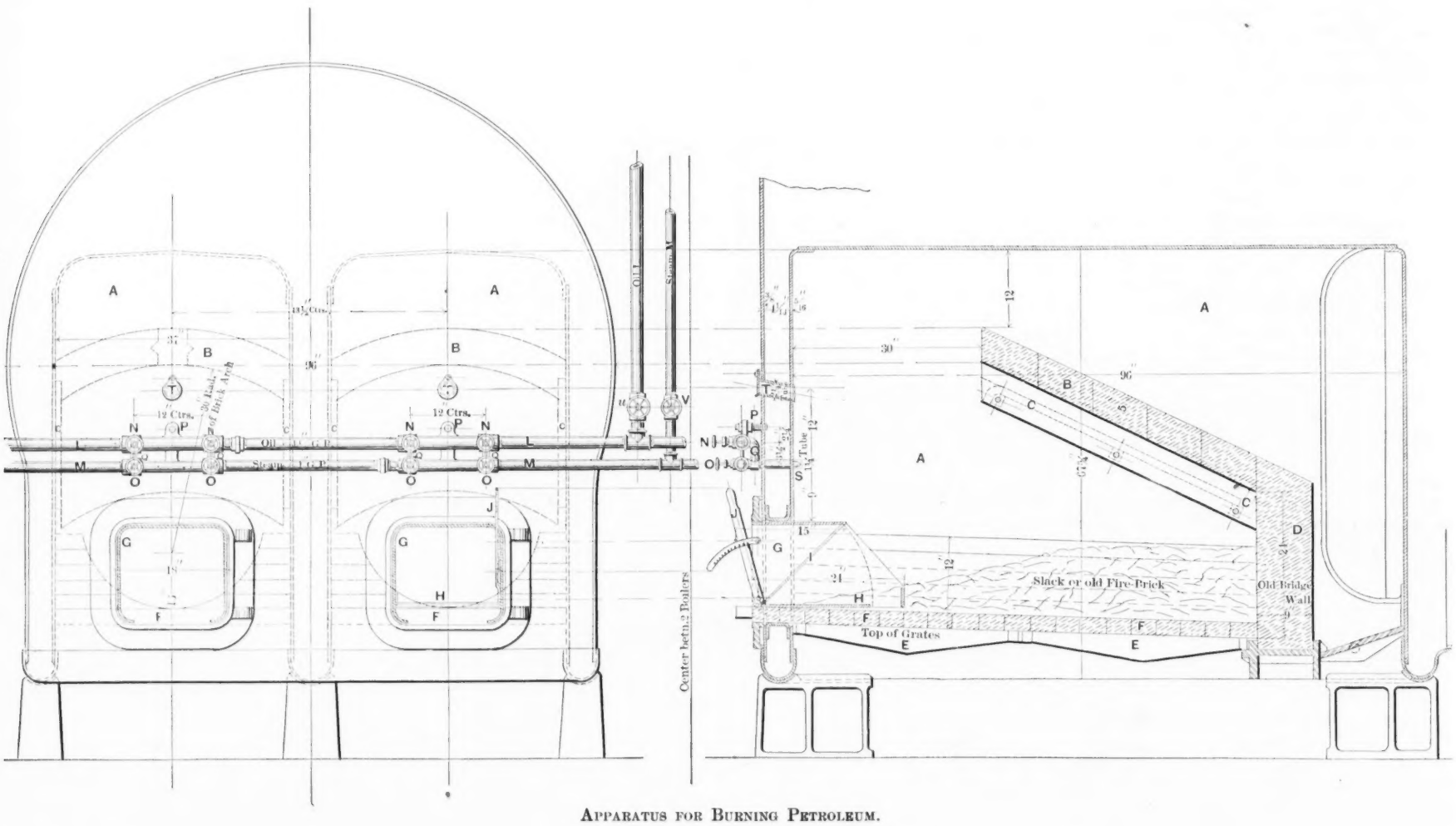
Apparatus for Burning Petroleum.

For the blue prints from which the engravings are made, we are indebted to A. J. Stevens, General Master Mechanic of the Central Pacific Railroad. They represent the arrangement for the steamer Solano. Mr. Stevens says:

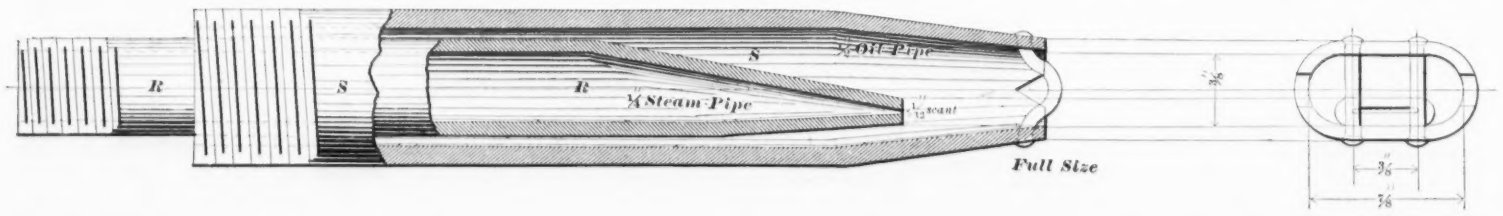
"I think you will understand [the prints] with but very little explanation, further than that we have fitted the furnace with fire-brick in such a way that it is practically a retort. The oil injected through the pipes, as you will understand from the drawings, is converted into gas under this arch, and the air passing in through the air regulator in the furnace door—which is left wide open, or nearly so—is blended with the carbon gases, hence perfect combustion takes place. The apparatus works first-rate. We are running our large ferry boat Solano, probably the largest boat of the kind in the world, and we are running other steamers successfully with this fuel. We are burning refuse or residuum petroleum, and we have not experienced the slightest difficulty in keeping up steam; in fact, we have much more steam now from the boilers than when we were burning coal.

"I do not know that, to you, there is anything particularly new in my arrangement, but I have never seen anything of the kind, and it seems to me that this apparatus is about what is required. We find the oil about 50 per cent. cheaper than coal. We can get up steam on a boiler with cold water in about thirty minutes, and the facility with which the oil is handled for fire makes the use of this kind of fuel very desirable on steamers. The fire can be entirely stopped or lighted in all of the boilers in a very few seconds."

The reference letters on the engravings are as follows: *A*, fire-box; *B*, back arch in fire-box; *C*, bar to hold up brick arch; *D*, bridge wall; *E*, grate bar; *F*, layers of fire-brick on top of grate; *G*, frame of air regulator; *H*, damper, open; *I*, damper, closed; *J*, lever to open damper; *K*, rack to hold lever in place; *L*, oil pipes; *M*, steam pipes; *N*, valve to regulate oil; *O*, valve to regulate steam; *P*, stud to hold valve in place; *Q*, connection between oil and steam; *R*, steam pipe, ¼″ inside of oil pipe; *S*, oil pipe, with wires at end to spray the oil in fire-box; *T*, peep hole; *U*, globe valve to shut off oil; *V*, globe valve to shut off steam.



Apparatus for Burning Petroleum.



Effect of Legislation Requiring Automatic Car Couplers.

(*From the Railway Review.*)

At the car-coupling meeting of the Master Car Builders' Association at Old Point Comfort, a speaker hazarded the remark that legislation on the subject of adoption of automatic car-couplers would only result in increasing the danger to employes, on account of the adoption of different devices which would not couple well together. This was taken up by another speaker—not a member of the association—who stated that he was positively informed that, as a result of the operation of the Massachusetts law, more lives had been sacrificed in car coupling than under the old link and pin system. This was perhaps intended as mere rhetorical exaggeration, but the speaker seemed to have derived his information from one or more Massachusetts men who were near him and were probably talking at random.

This statement had its effect in aiding the passage of that ill-considered and unwise resolution deprecating legislation on the subject of car coupling:

Resolved: It is the opinion of this convention that the independent action of State legislatures in enforcing the use of some form of automatic or safety coupler is already resulting in greater danger to employes in coupling cars, than they were subjected to before such action went into effect; and that any similar further action of legislatures will greatly increase the danger to employes.

It is remarkable that so intelligent a body of men should have been led into putting such an opinion as this on record, without even questioning the statements made. The result shows that the opinion was wrong; and confidence in the wisdom and earnestness of the association is greatly impaired thereby. As soon as the railway commissioners of Massachusetts read the report of the discussion in the railway journals, they issued the following circular:

Commonwealth of Massachusetts,
Board of Railroad Commissioners,
No. 20 Beacon St., Boston, June 23, 1885.

To the Superintendents of the Several Railroads:

In all future reports of accidents, fatal or other wise, arising from the coupling or uncoupling of freight cars, it is desired that the nature of the couplers used should be stated.

You are also requested to state to the board, as soon as may be, the number and nature of such accidents that have occurred since March 1, 1885, where either of the couplers was one of those prescribed, under the law, by the board by its order of December 5, 1884. Per order,

Wm. A. Crafts, Clerk.

Replies have, at this writing, been received

from three-fourths of the railways in this State, and not a case is reported of any injury to any one resulting from the use of any of the couplers prescribed by the commissioners, December 5, 1884. If any such accident had occurred, it would have been reported before this.

"Opinions" are not worth much in the face of facts. It is certainly unwise for the Car Builders' Association to resolve itself into a stumbling block. We have never advocated legislative interference with railway operation, but we believe the time has come for the law to step in for the preservation of human life and limb. Since the lawgivers have manifested an inclination to do this, the Car Builders' Association has done more toward the solution of the car-coupling question than it did before in the whole course of its existence. It has been driven "from jest to earnest." But it will not do for it yet to cry out to "the politician," "Hands off! We are solving this problem. Let us alone and give us plenty of time. You will kill more than you will save by interfering." If the legislative screws are taken off, the Car Builders' Association will vote at once "to lay the matter on the table." This able and active body of men look only at the mechanical difficulties, and see hope of better things only in delay. They mean well enough, but they want to wait for that mechanical evolution of car-couplers, which, in the nature of things, can only come with practical use, and not before it. But, meantime, the car of Juggernaut rolls on, and lives and limbs are sacrificed which might be saved and ought to be saved.

There is and can be no valid objection to such legislation, and action under it, as has obtained in Massachusetts. We hope to see other States follow this humane and temperate example, and speed the day when car-coupling shall be done automatically everywhere.

Brown's Expanding Machine Reamer.

The accompanying cuts represent a new expanding machine reamer, recommended for manufacturers where the maintenance of standard or special sizes is essential.

The cutters are made of the best tool steel, and are nicely fitted into unequally-spaced radial slots, cut through the end of the reamer, and bed on the conical head of a plug screwed into the head of the reamer. They are held in position more firmly by a nut on the projecting end of the plug.

When it is desired to expand the reamer, this nut is backed off and the plug screwed in, forcing the cutters out the desired amount.

The tool is not designed as an adjustable reamer in the strictest sense of the word, but as a standard reamer with a compensation for wear.

The body is ground slightly under standard size to insure clearance, and the cutters must be expanded and maintained to that size, doing away with the objection to a strictly adjustable reamer, that when adjusted above or below a standard size, in some special case, it is not returned to the original or standard size by the workman.

These reamers are made entirely of steel, well finished, by W. H. Pruyne, Syracuse, N. Y.

The pipes by which petroleum is transported from the oil regions to the seaboard are cleaned by means of a stem 2½ feet long, having at its front end a diaphragm made of wings, which can fold on each other, and thus enable it to pass an obstruction it cannot remove. This machine carries a set of steel scrapers somewhat like those used in cleaning boilers. It is put into the pipes and propelled by the pressure transmitted from the pumps from one station to another. Relays of men follow the scraper by the noise it makes in its progress, one party taking up the pursuit as the other is exhausted. They must not let it get out of their hearing, for if it stops unnoticed its location can only be established by cutting the pipe.—*The Sun.*

A St. Louis correspondent of the *Railway Age*, in discussing whether there is room for further improvement in the locomotive, says:

Attempts at improving certain parts of the locomotive have been for the most part a sort of patching-up process. We must strike at the root of the evil, and, if necessary, clear away the entire antiquated fabric to make room for the new. As a result of careful inquiry and observation, I am led to believe that the average life of the locomotive has been considerably shortened of late years, and it is particularly noticeable on roads using "piece-work" built engines, or in whose shops the piece-work system is in vogue. After an intimate acquaintance with piece-work built engines for some years, I cannot speak otherwise than disparagingly of them, and should I ever be so fortunate as to control the purchasing of railroad rolling stock, I would not accept such engines as a gift. The quality of the material entering into the construction of such engines may be of the best, but its manipulation under the piece-work system detracts from its work to a considerable degree. This may not be apparent on casual inspection as the engine leaves the shop, but it will become clearly manifest when the engine is brought in for a general overhauling after a few months' service. I cannot too strongly animadvert upon the piece-work system as applied to building and repairing locomotives, and any road adopting it will find in the long run that it is a most pernicious and unprofitable experiment.

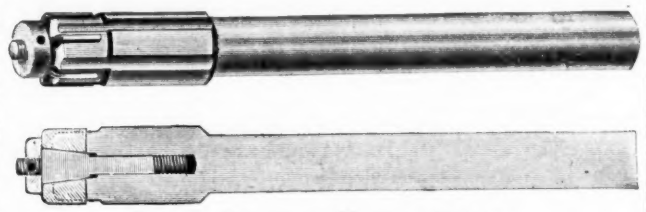
New 25-Inch Shaper.

This shaper has a stroke of 25 inches; and increased speed of pulleys, and consequent gain of power on cutter bar. The driving and feed shafts have extra outside bearings or supports.

The machine has improved friction driving movement, and the cutter bar is guaranteed to work up to a line and reverse without jar or noise. Weight of machine, 2,700 pounds; size of tight and loose pulleys on countershaft, 12″x3″; speed of countershaft, 250 revolutions.

Manufactured by the Hendey Machine Company, Torrington, Conn.

We have provided an "office cat." Hereafter, when questions are asked us and the documents get mislaid, we trust our correspondents will write again. "It was the cat."



Brown's Expanding Machine Reamer.

Engineers' Societies—Small Things—Babbitting Boxes—That Hog-Nose Drill.

By James F. Hobart.

The first time we attended a meeting of a "Society of Stationary Engineers," we got thoroughly disgusted with said meeting. We have attended many meetings since then, and we get disgusted about every time.

We go to the meeting about as a machinist goes at a nice new job, viz: we think we are going to get a fine good thing out of it, and we get all ready to absorb lots of experience from the boys; to catch on to lots of new ideas from the speaker of the evening. We sit in that hall three mortal hours, and what do we hear? We hear a long discourse upon the assumed good qualities of a certain engine for which the speaker is agent.

We read the same story a week afterward in a little pamphlet, which said engine builders issued, and issued for advertising purposes. We don't want any of this advertising business in the meetings of societies or associations. It kills the object of said association deader than last year's leaves, and the knowledge-seeking mechanic gets disgusted and clears out.

Another trouble with the association is that two or three men are always sure to run the whole business. They get elected president, secretary and treasurer, and then run the association for the purpose of showing themselves off. Many times these same few men know less of steam than they do of beer, and the poor chap who tries to get up a little discussion among the boys, is snubbed instead of encouraged in his bashful efforts to say his few words; he gets mad, tells the association to "go to the ——," and takes himself to the corner gin-mill and patches up his wounded feelings.

We think associations would be first-class educators if they could be brought down among the every-day "fellows" who are the real engineers, but somebody who has got a good "gift of gab," worms himself into the concern and goes to advertising himself, his wares, or his friends before Tom or Bill have got their courage screwed up high enough to keep their knees stiff while they say "Mr. President."

About every association or society we have come in contact with, has more or less of this element. It is there from the humblest society of workmen, up to the A. S. M. E. itself.

We want no part in an association until these fellows are kicked out, and kept out.

Everybody is trying to cut down expenses. Ten cents saved, means a chance to live in these times of sharp competition. Ten years ago, a man would have been called a fool or a "pinch-penny" if he had practiced one-tenth the little economies of to-day, and there is a big field yet for carrying the business still further.

Look around the shop and notice the belts. Who takes care of them? Give it up. Nobody takes care of them until they break or run off, and then the man who *must* use that particular belt, will patch it up "just to do this job with," and so it goes until it comes to pieces again.

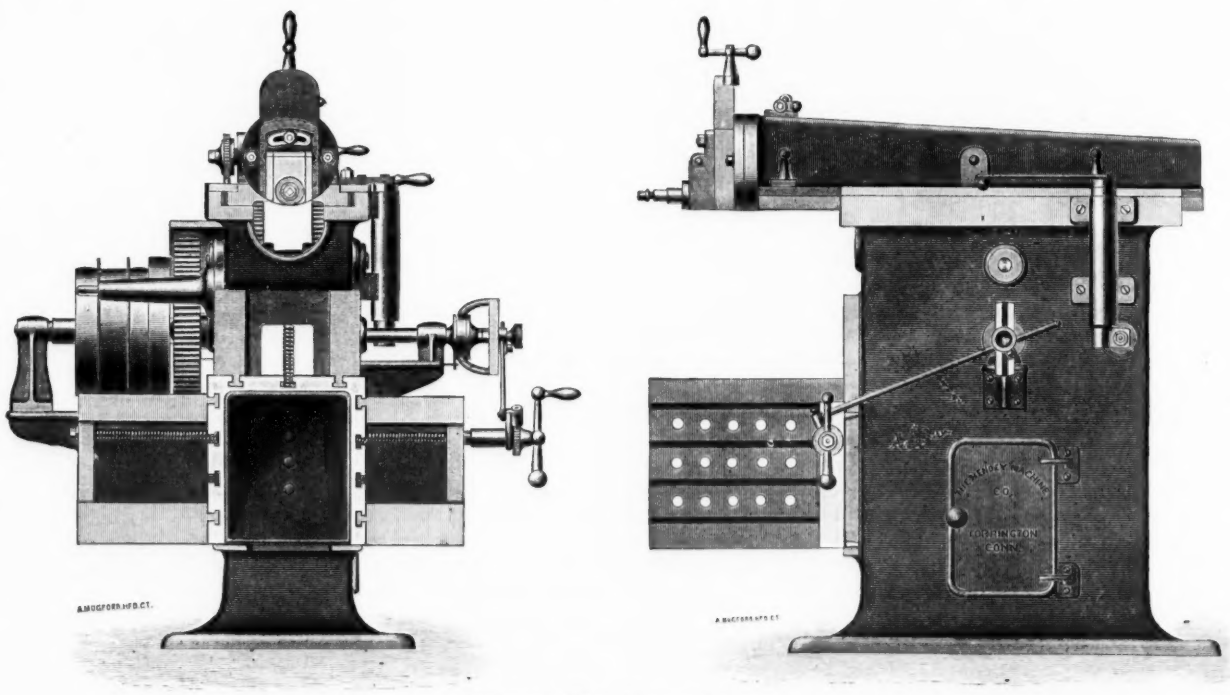
Take a friction card from your engine with all the shafting and belts running. Where is it? Almost frightens you, don't it? Now go all over your shop and overhaul every belt. Get just the right tension to every one. Had to put 6″ into that 10″ belt didn't you? Well there are two horse-power saved right on that belt. By the time you get all around, you find the indicator has got a big story to tell, and you are astonished at the saving you have made in the coal heap.

It pays to have somebody to look after all these little things. A man to oil up is a thing of course in most shops to-day, but a belt-fixer is not found twice in twenty shops in all the land.

A man to look after shop sweepings is an important member of our economical fraternity. It is proverbial that a machinist in need of two washers, will go and get four, and lay the extra two upon a keg, or a lathe bed, and the next time he wants a tool, he knocks the two washers into the lathe chips, and they go "nobody knows where." In a big shop, a "dirt sorter" will save his wages twice over.

Once we worked in a shop where they used to sweep the iron turnings under the floor. The sills and floor timbers were within six inches of the ground, and the dirt holes through the floor soon got filled up. A new plank would be started up, and as the space beneath it got filled, still another one would be utilized. As time went on, the space beneath the floor got all filled up solid. When the floor rotted out, the iron filling was as hard as rock. New floor timbers were put in place of the old ones, but they had to be made smaller in order to get them into the holes. Cement was run in beside the new timbers, the new floor laid, and no machine shop in the world has a better foundation. It was just simply "solid."

We can't spare iron chips and turnings this year, for floor fillings. It must go into the cupola, and come out again as good as new. All the washers and rivets must be picked out and assorted, carried to their



Hendey's New 25-inch Shaper.

respective places, and made to earn their share of a living.

We must have somebody in our shops who makes a business of looking after the little things. Here is where the money is saved. Watch Tim babbitt a box. He melts a ladleful of composition or babbitt, and when hot, he scrapes off all the dross, and throws it on the floor. By the time he gets to where the box is placed, he finds another layer of oxide on the metal and takes time to neatly skim that off also. The box gets full and runs over. Five or six ounces of metal run on the floor among the pieces of iron, coal, cinders and general litter.

When Tim trims up the box with cold chisel and file, he gets rid of two ounces more of babbitt in shape of little chips, which fly all over his bench, out of the window, and into his neighbor's face and eyes. Sometimes Tim takes time to pick up from the floor, the larger lumps of babbitt, but often he is in "a hurry and can't stop just now," so ten cents' worth of babbitt metal gets lost. The chips around the vise are never thought of again, except to be growled at when they get on the floor, and hurt somebody's pet corn.

John Saver has got a good little rig for babbitting boxes. It cost him about ten dollars, aud he loses no babbitt. Saver don't melt babbitt over a forge fire. It is an abominable practice. Whenever a little metal gets spilled into the fire, or Tim stirs the metal with the poker, and then pokes the fire with a little cold metal adhering to the poker, then the next man who tries to weld with said fire, has more fun than he wants. You will find him swearing at Tim, and burning salt and prussiate of potash in a new fire in order to drive off the lead.

Saver has a little furnace in which he melts his babbitt. It is much like a type founder's furnace, but he made it out of boiler iron. He has a shallow sheet-iron pan to put under a box which is to be babbitted. He has got three pans, from an ordinary baking pan, up to a six feet square for big work. They are only one or two inches deep, but they save the babbitt.

Saver never loses metal through oxidation. His man keeps the top of the melting pot covered with powdered charcoal, and no "dross" can form. If Saver should chance to find a lot of "dross" upon his babbitt, he would not throw it upon the floor. No, sir! That oxide would be mixed with charcoal and get smelted. He recovers the metal, instead of throwing it away. His iron pans keep it from getting lost on the floor, and all small stuff must be chipped, filed and scraped at one particular bench, where fine wire netting takes in the flying chips and saves them for "next time."

When Saver wants to use babbitt, he don't have to hang around the forge with a ladle until the blacksmith lets up. Not a bit. He lights his little fire under the babbitt furnace, and, by the time he gets his box rigged up on an arbor, the babbitt is ready to pour.

A sufficient quantity is dipped out with a ladle, and poured right into the box. If it must be carried to a distance, Saver dips up some of the powdered coal with the hot metal; but otherwise the ladle, after dipping until warm, is slid down close to the side of the pot, and the metal runs in clean, bright and sparkling.

Saver don't use a set rule as regards heating his metal. He says the old rule of "just scorching a white pine stick" is good enough for the general run of work, but he always heats according to the nature of the work.

"Just hot enough to fill" is his rule. If the babbitt is to lie an inch thick in the box, it need not be hot enough to scorch a pine stick; but if it must run into a place where a large surface must be covered $\frac{1}{8}$" or less in thickness, then Saver will heat his metal almost red-hot. It shrinks less when poured cool than when poured red-hot, and for a solid, whole box should be used as cool as possible.

A request has been made for a description and cuts of the "hog-nose" drill, and we intended to prepare the same for this issue of the American Machinist, but, upon reading Mr. Goodyear's excellent description of that useful tool in the issue of July 18, we concluded that the parties interested will find his description sufficient for their needs, although Mr. G. seems completely disgusted with its rather unpoetical Bay State name. However, Mr. G. can recollect that "a rose smells as sweet," etc., and our "hog-nose" cuts just as well in Massachusetts as his "cannon" drill does in Connecticut.

The best way to get up this kind of a drill is to buy it ready-made. You can make it if you want to, but it will cost more, and you run the chances of getting an inferior tool when it is done.

Turn up the drill in a good lathe on first-class centers, and then mill away half of it. Commence at the end and mill out half the center, and so along until you get nearly to the shank; then temper and grind up true. The manner of cutting the lip was described by Mr. Goodyear, but we file back the remaining half of the drill, making it about $\frac{1}{20}$" or $\frac{1}{16}$" shorter than the cutting lip.

"Grandfather" used to make his drill that way, but Bill's grandfather didn't know that such a drill existed. Bill don't know it either; and of one hundred shops in the United States, take them as they come, sixty of these shops will not acknowledge acquaintance with the "porcine proboscis" drill.

"There's nothing new under the sun," the "old fellow" said, and it is just as true today as when he said it, but it does not stand to reason because we know a thing, that everybody knows the same thing just because we happen to.

We are going to tell what we know, and then we won't get "grumpy" because somebody gets up and says, "I know that as well as you do."

A New Lighthouse.

The Colwell Iron Works, foot of Twenty-seventh Street, New York, have recently completed an iron lighthouse for the United States Government, to be erected at the Delaware Breakwater. It is in the form of the frustum of a cone, 22 feet diameter at the base, and 18 feet diameter at a height of 30 feet. On top of the tower proper is a circular watch room and gallery, and on this the lantern room and gallery. The lantern room is octagonal in form. The iron structure will stand on 30 feet of masonry, making the total height about 80 feet. The outside of the iron tower is made of cast-iron plates five-eighths of an inch in thickness, with flanges on the inside for bolting together; the flanges and edges of plates are planed to make water-tight joints. The courses of plates are arranged to break joints, and present a smooth exterior, except at the doors and windows; here the mouldings, together with the galleries, give a pleasing architectural effect to the whole. The floors, three in number, besides the light room floor, are supported by cast-iron columns; the floors are composed of radiating cast-iron plates, flanged, planed and bolted together in tight joints.

The tower was erected complete at the Colwell Works, where the room and excellent crane facilities greatly aided the operation.

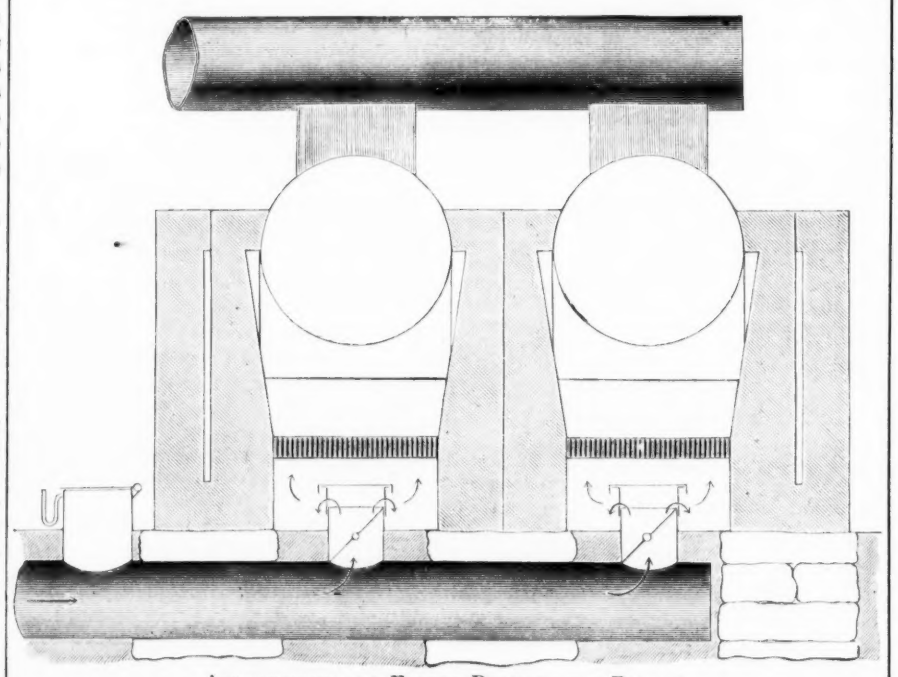
The job is altogether a very creditable one to the builders, and was in all respects approved by the Government inspectors. This form of lighthouse is durable and cheap, and will undoubtedly be the rule in the future.

The total weight of the metal work is about 200 tons.

Forced Draft for Boilers.

From The Locomotive, *published by the Hartford Steam Boiler Inspection and Insurance Company.*

The question frequently arises, Is the use of a blower for producing draft for a boiler furnace to be recommended? And is it in any way injurious to the boiler? The answer to this latter question may be Yes, or it may be No. It depends almost wholly on whether the blowing apparatus is properly or improperly arranged and managed.



Arrangement for Forced Draught for Boilers.

The proper use of a blower is not injurious to a boiler; its abuse most certainly is.

The force of a good, natural draft will balance a column of water, measured in a siphon gauge, or such an apparatus as that figured and described in *The Locomotive*, May, 1884, from $\frac{3}{4}$ inch to 1 inch in height. This is equal to a pressure of from $\frac{1}{37}$ to $\frac{1}{28}$ of a pound per square inch; or, say, from $\frac{7}{16}$ to $\frac{9}{16}$ of an ounce. If the pressure of air from a blower does not exceed this, the fires will not be any more intense than with natural draft; and if precautions are taken to admit it properly to the ash-pit, no more damage can be done.

Much of the damage done by blowers may be traced to the fact that, in most cases, the current of air is allowed to blow directly against some *portion* of the grate. This causes unequal combustion of the layer of fuel, holes are burned through, and currents of air pass through and strike the boiler shell. This is apt to injure the boiler, and also diminishes the efficiency of the system.

The air should be discharged into the ash-pit in a downward direction, and so diffused that an equal air pressure is established beneath the whole grate surface. Uniform combustion of the layer of fuel is thus easily attained, and the best possible results realized.

The pipes for conveying the air from the blower should be of good size—one-half the area through flues of boiler will be found about right. This enables more perfect control over the pressure, and better equalization of the supply to each boiler, when there are several boilers running together, to be obtained.

The main conduit, or supply pipe, should be provided with a relief valve, near or attached to which should be a siphon, or other gauge, to enable the pressure to be accurately adjusted to suit the requirements of different fuels. A pressure sufficient to balance one inch of water will be found to give sufficient air to burn the most difficult fuels, such as slack or screenings.

The individual supply pipe to each boiler should be provided with a valve, to enable the blast to be shut off when the fires are to be cleaned, or fresh supplies of fuel added. When the supply to one or more of the boilers is thus shut off, the relief valve in main pipe (which should be weighted to the exact pressure required to furnish proper draught) will open and discharge the excess, and thus no harm can be done to the other fires.

Our illustration shows a very simple arrangement. Two boilers are shown. The supply pipe is shown as coming in at the left-hand side. Just outside the setting wall may be seen the relief valve, with water gauge attached. Passing under the boilers, a riser, furnished with a butterfly throttle, delivers air into each ash-pit. The top of each riser has a metal cover, which answers the double purpose of distributing the air supply and keeping the risers, or supply pipes, free from ashes. Further explanation of the cut is unnecessary.

The following short table shows the pressure of air for different heights of water in the siphon gauge:

TABLE SHOWING PRESSURE PER SQUARE INCH OF AIR FOR DIFFERENT HEIGHTS OF WATER IN SIPHON GAUGE.

Height of Water in Gauge.	Pressure in Pounds per Square Inch.	Height of Water in Gauge.	Pressure in Pounds per Square Inch.
.25″	.009	.63″	.0227
.26	.0094	.64	.0231
.27	.0097	.65	.0234
.28	.0101	.66	.0238
.29	.0105	.67	.0242
.30	.0108	.68	.0245
.31	.0112	.69	.0249
.32	.0115	.70	.0252
.33	.0119	.71	.0256
.34	0123	.72	.026
.35	.0126	.73	.0263
.36	.013	.74	.0267
.37	.0133	.75	.0270
.38	.0137	.76	.0274
.39	.0141	.77	.0278
.40	.0144	.78	.0281
.41	.0148	.79	.0285
.42	.0151	.80	.0288
.43	.0155	.81	.0292
.44	.0159	.82	.0296
.45	.0162	.83	.0299
46	.0166	.84	.0303
.47	.0169	.85	.0307
.48	.0173	.86	.031
49	.0177	.87	.0314
.50	018	.88	.0317
.51	.0184	.89	.0321
.52	.0188	.90	.0325
.53	.0191	.91	.0328
.54	.0195	.92	.0332
.55	.0198	.93	.0335
.56	.0202	.94	.0339
.57	.0206	.95	.0343
.58	.0209	.96	.0346
.59	.0213	.97	.035
.60	.0216	.98	.0353
.61	.022	.99	.0357
.62	.0224	1 00	.0361

This table enables comparison of draught pressure and pressure per square inch to be easily made by using it in connection with that found on page 68 of our last volume.

Spark Arresters, Extension Brick Arches and Cheap Fuel on Locomotives.

The committee on Spark Arresters made a report at the recent convention of the Master Mechanics' Association, which was received and discussed as follows:

Mr. Lockwood—"My experience is that at the very high speed where we had a spark-arrester, it choked the engine all up. While it worked very well at 45 miles an hour, when we got up to 60 or 65 the engine was all choked up. My remarks have a direct relation to an engine that does not require a smoke stack. You exhaust out of the smoke stack through a six-inch opening. We could not make speed enough to run 65

miles an hour with three-inch, showing the variation between those two speeds. Recently we have been burning crude petroleum. The last test was on the main line of the Reading Railroad. The speed test showed fifty-five miles an hour. The pulling test showed the engine pulled 54 cars, three of them only being empty. That stalled the engine. With a starter she took that train and distributed it over the line, blowing off steam at all times with 138 pounds pressure. She had five of those burners in her. As to the economy of that, the engine had steam up and remained without any fire under her for 24 hours. The cost was 35 cents to get up 130 pounds of steam. The estimated cost of controlling her, so far as her test is concerned, is that a gallon of petroleum will make a train mile of service. That gallon will cost three and a-half cents. It is very simple in operation. The best data we have from our own tests is equal to 175 lbs. of the best bituminous coal. I have here a statement given me as to what they claim: 'The distinctive features of burning crude petroleum are by a super-heating system in the fire-box and mixing it with crude petroleum, converting that into a gas and burning the gas so that there is no carbon deposited at all after the engine is started. Should there be any surplus in the mixture of the two, they strain this mixture on a sheet plate, and supply a sheet iron plate to aid combustion."

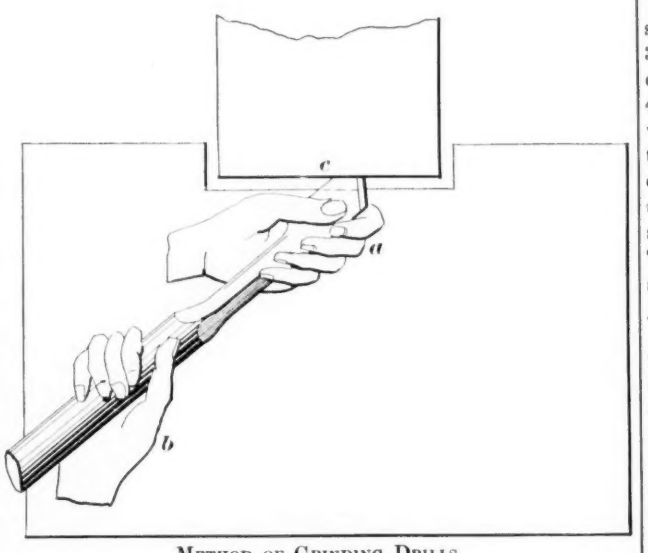
Mr. Meehan (Cincinnati Southern)—"I have had such universal success with the brick arch that I cannot let the report of the committee on that point pass. We are using the extension brick arch. We tried the extension first without a brick arch and did not get very good results, except in the saving of sparks. We added the brick arch, and I can safely say we got a saving of 30 per cent. We have a much cleaner train. We get away with about 70 per cent. of the smoke. If our engines are used on a heavy train and throw sparks, we put another brick on. If they are running on light service we take off a brick. We use the brick extended across the water pipe, and when the brick lays there a short time it becomes solid, and fastens itself on the pipe. We open the space between the brick and the side sheet one and a half to two inches. I cannot understand how it is injurious to the side sheet. We never found any bad effect there, nor to the throat sheets, nor to the crown sheets. We use five different kinds of coal, and we meet with the same success with each. The only question of importance about the extension is to get it tight. If the work is well done, and the extension is got tight, there will never be any trouble. In a few cases, when we first commenced with the extension, we had some trouble with the extension heating and getting red—burning out. If we were to throw away the question of economy in the fuel, the economy that we found in the wear and tear of the old-fashioned stack and cleaning the flues would make it pay us. We have consolidation engines that have been in service for two years, and on which the front end has not been open. In a short time we got over the difficulty about the extension burning out by paying close attention to its construction. I think Mr. Smith, of the Kentucky Central, has put on the extension in the last few months, and he tells me he is getting just as good results from it as I am. In consequence of considerable variation of opinion about the matter, we had a construction engine that was equipped with the diamond stack. After the use of the extension and brick arch for two or three years, I thought I would put her in service in competition with another engine in about the same condition. Engine 22 was equipped with the diamond stack. Engine 17 had the extension and brick arch. We put them in service on an accommodation train, and we got the same results that we did when we commenced. Our engines will maintain 145 pounds pressure against a No. 9 Monitor injector, and I believe the No. 9 Monitor injector that we use has a little more capacity than the ordinary No. 9. Our engines are very large and pull heavy trains, and the injector delivers about 3,000 gallons an hour."

Mr. Turreff (C. C. C. & I.)—"The committee state that economical results could be obtained with good fuel. We did not want to have it stated that there was no economy in the use of the brick arch."

Mr. Meehan—"I would state that the fuel we are using is not No. 1 fuel. If there are any gentlemen here from Alabama or Tennessee, they know the quality of coal we are using there. Even with the slack coal that we are burning on switch engines—which we buy for 15 cents a ton, while a fair article costs $1.80—we get the very best of results with the brick arch and extension."

Mr. Blackwell—"Before I left the Norfolk & Western road, we were getting excellent results from burning slack coal that cost 50 cents a ton, and we burned it satisfactorily with the brick arch and extension front, and had no trouble with our heaviest freight trains drawn by 20x24 cylinder engines. The economy in using slack coal, owing to the difference in price, we found amounted to something in the neighborhood of $80 per engine per month."

Mr. Woodcock—"I think, in a former statement a year or two ago I made reference to the smoke-box, and stated that we estimated a saving of 20 per cent. over the old style. We now have some 35 extension boxes, all of which work very satisfactorily, and I have no reason to make any correction in the former statement. I believe we are saving some fuel, but independent of that, I think the advantage we have gained is in preventing fire. We consider it the most satisfactory spark-arrester that we have ever used, especially with anthracite coal.



Method of Grinding Drills.

Cement for Pipe Threads.

Referring to a recent inquiry published in our columns about the best cement for pipe threads, in which it was stated that red and white lead and boiled oil had been used, but something was wanted that would dry quicker, a correspondent says: "Good refined plumbago (graphite) and boiled linseed is better than either. It is perfect as a cement, and if necessary to unscrew, one turn of the wrench is sufficient."

LETTERS FROM PRACTICAL MEN.

Grinding Drills.

Editor American Machinist:

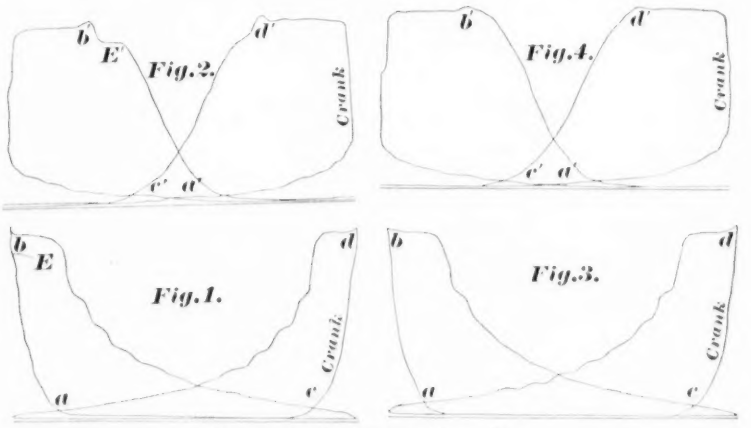
I notice a good deal of talk about grinding thread tools, and other lathe tools, but nothing about grinding twist or flat drills, either for lathe or drill press work. Most men or boys, or those that have the handling of them, would say, "Why, that is nothing to do, give us something harder." There are always one or more sides to almost everything, except a boilermaker's half round seamer, which in general, resembles a stone-cutter's mallet, neither round, square nor oval; but they are not generally to blame, as some one else has the making of it. The grinding of drills is something that sometimes has more sides than are wanted, or the hole made by it has, as a great many can bear witness to. I do not mean work done by the modern twist-drill grinding machine (which ought to be in every shop in the land as a money-saving machine), but doing the work on an ordinary grindstone or emery-wheel.

The sketch will show my method, and with a little care and practice, paying attention to what is being done, any man or boy, whether expert or not, can grind a drill every time, and not have one lip longer than the other. I like to have a piece of plank on each end of the frame screwed to adjust towards the stone, as it wears down. This gives a foundation or rest, often handy for various purposes. The front one can be dispensed with, if there is a good cast-iron or wrought-iron rest fastened to the frame to steady the tool by. Another good addition is an old coat, or a jumper or two, that have done duty in another sphere, folded and fastened to the back of the stone to catch the excess of water, and in a measure keep the stone clean. You that have never tried it, do so now, and see the effect and benefit of it.

Take the drill in the right hand by the shank, as near the end as convenient, palm of hand up, placing the left hand, palm up, as near the stone or wheel as may be, without touching. Now lay the drill in, with the cutting edge against the stone, at the angle desired. Clasp it with the thumb and fingers, as at *a*, bring the right hand at a rest also, as at *b*, keeping both in the same position at all times, until the job is done. After grinding one side, turn by the fingers of each hand, and grind the other side, reversing from time to time, touching lightly at the finish.

This virtually makes a universal drill holder, and is as good for a twist drill as a flat one, except that the twist drill should have a rolling movement to give clearance, being careful not to touch the other lip. I find it a good plan to grind the sides of a flat drill, as at *c*, parallel, and a little rounding instead of square. This will act as a guide, to a certain extent, and make a smooth hole, besides a round one, and is not so apt to catch on going through the work.

William H. Butler.



Indicator Diagrams, Half Size.

Indicator Practice.

Editor American Machinist:

The accompanying diagrams and explanations are offered as a possible aid to practical engineers and experts who have had experience in the running of engines in which, after all the bearings are perfectly adjusted, there is still a jar, which, in some cases, may be hardly noticeable, in others heavier and more excruciating. The evil is sometimes hard to locate, and is remedied (if at all), only after repeated trials. We generally attribute it to imperfect admission, which may or may not be the cause.

The following plan I first used in one of those aggravating cases of "dull thud," and have since found it valuable in my practice.

Diagrams 1 and 2 were taken from the same engine, under the same conditions; 3 and 4, after a slightly different adjustment of certain parts of the engine. For 2 and 4 the motion of the drum was adjusted at a variation of about 90° from that of the piston. When the engine piston is at its slowest travel the drum motion is fastest, and *vice versa*, thus stretching out the admission and compression lines over a long space. The lines *a' b'* and *c' d'*, Figs. 2 and 4, correspond to *a b* and *c d* in 1 and 3. An *exact* adjustment of 90° variation is unnecessary.

The drum motion is conveniently obtained from the eccentric. A wire is attached to the strap (cord is too elastic), and led off in the direction to give the proper rapid motion with the engine on the center. A short wooden lever is nicely pivoted near its middle, in position to receive the free end of this wire. The other end of the lever (which may be longer or shorter, as it is desired to lengthen or shorten the diagram), carries another wire, which is hooked to the cord near the indicator drum. The lever will generally be more or less of bell-crank form, since each arm must stand at right angles to its respective wire when at the center of movement.

All the lines in these cards closely approach the theoretical, and illustrate how defects may in this way be discovered, which is otherwise hardly possible. The line *a b*, Fig. 1, shows a slight imperfection at *E*, which is magnified at *E'*, Fig. 2. Corresponding lines on the other end are also imperfect, but in less degree. Our first thought is, vibration in the indicator may have caused the defects; but the movement is the most rapid at the crank end, while the imperfection is greatest at the other; so we look farther. We next attribute it to condensation, or too slow admission, but *know*, in this case, that compression and admission do not unite at *E* and *E'*. We therefore conclude there must be a leak past the piston rings at that point, which we find to be the case. Figs. 3 and 4 show the defect removed.

The imperfect working of the indicator will be magnified, and a light movement is desirable, but no more so in this case than in others.

This method will be found to be of great assistance, frequently enabling us to locate difficulties that will not be readily found by the ordinary diagram.

Ferris Ogden.

Mount Vernon, Ohio.

Casting Rolls on Wrought Iron.

Editor American Machinist:

A plan I have followed with excellent results in casting rolls on wrought-iron shafts is as follows: My rolls were 5 feet long and 12 inches in diameter; shaft 2 inches in diameter, 6 inches of the shaft projecting from each end of the roll.

I got a pattern turned up the size of the shaft at each end. The portion of the shaft that was required to be in the mould had on the pattern a sleeve turned tapering towards the ends, leaving the pattern 5 inches in diameter in the center, and 4 inches in diameter at the ends. The sleeve pattern was 2 inches shorter than the roll. This pattern was then moulded in green sand on the flat and faced with strong facing, so that it would peel readily. The shaft had a number of countersinks in it; the two end ones were just outside of the sleeve pattern.

When all ready for pouring, the shaft, previously heated, was placed in the mould and cast. As soon as it was set, the mould was then shook out and the shaft with the sleeve cast on it was lifted out, and the gates and sand knocked off. Any sand that still adhered to the casting was rubbed off with a wire brush. It was then set in the dry sand mould of the roll, which was made to be cast on end and poured from the bottom with risers on top of roll. The flask was then closed, fastened up and hoisted on end, the head made up and the roll poured and fed up in the usual manner.

By casting rolls with the sleeve I very seldom found a dirty casting or a loose shaft; these rolls had to be turned all over.

C. C. O'Neil,
Late Manager Alness Foundry,
Halifax, N. S.

Division of Power—The Feed-Water Question.

Editor American Machinist:

In No. 28 Mr. James Hobart advocates what is quite fashionable among a great many mechanics, viz.: the division of motive power.

What he says of water wheels may be true, but a steam engine is different, in that the cost of fuel, cost in attendance, etc., has to be taken into account. The greatest need in the world for a division of power, and the greatest risk run by breaking down, is on an ocean steamship.

Seeing this, let Mr. Hobart go to a steamship company and say to them: "You are taking a tremendous risk with your big engine, for should anything break, your voyage would be three times as long; or you would have to pay $50,000 for towing, or you might loose your ship in a storm. Now this risk can be all taken away. Instead of putting in your 3,000 horse-power engine put in thirty 100 horse-power, each with a shaft and propeller, and then you are safe.

"There is another thing must be taken into account, however. Your small engines, etc., will take up more room, and require a greater number of attendants; will cost more for coal; your boiler will have to be larger, and coal bunkers will also take up more room; in fact, you may not have much room for cargo, and your expense will be greater, but you are running no risk."

How many converts will he get? For land purposes where real estate costs more than machinery, a great many of the remarks will apply. But take it where real estate is cheap. Instead of putting in your large compound engine with a horse-power produced from 1.75 lbs. coal per hour, and skilled attendance, put in a number of small engines, in as many different places, and to keep your labor account down, hire a number of cheap attendants at a still greater aggregate cost over the skilled man, and run the fuel account up to 2.50 to 4 lbs. coal per horse-power, and with all the possibilities of the large crew of cheap help, how will the books foot up at the end of the year?

The controversy on the air brake question where the resistance overcome exceeds the power, reminds one of the heater question where the feed water takes up more heat than is contained within the exhaust from which it receives the heat, and yet good men and true are ready to take oath it is done.

W. E. Crane.

Waterbury, Conn.

Richmond & Danville Railroad Co.'s Cast Iron Smoke Stack.

Editor American Machinist:

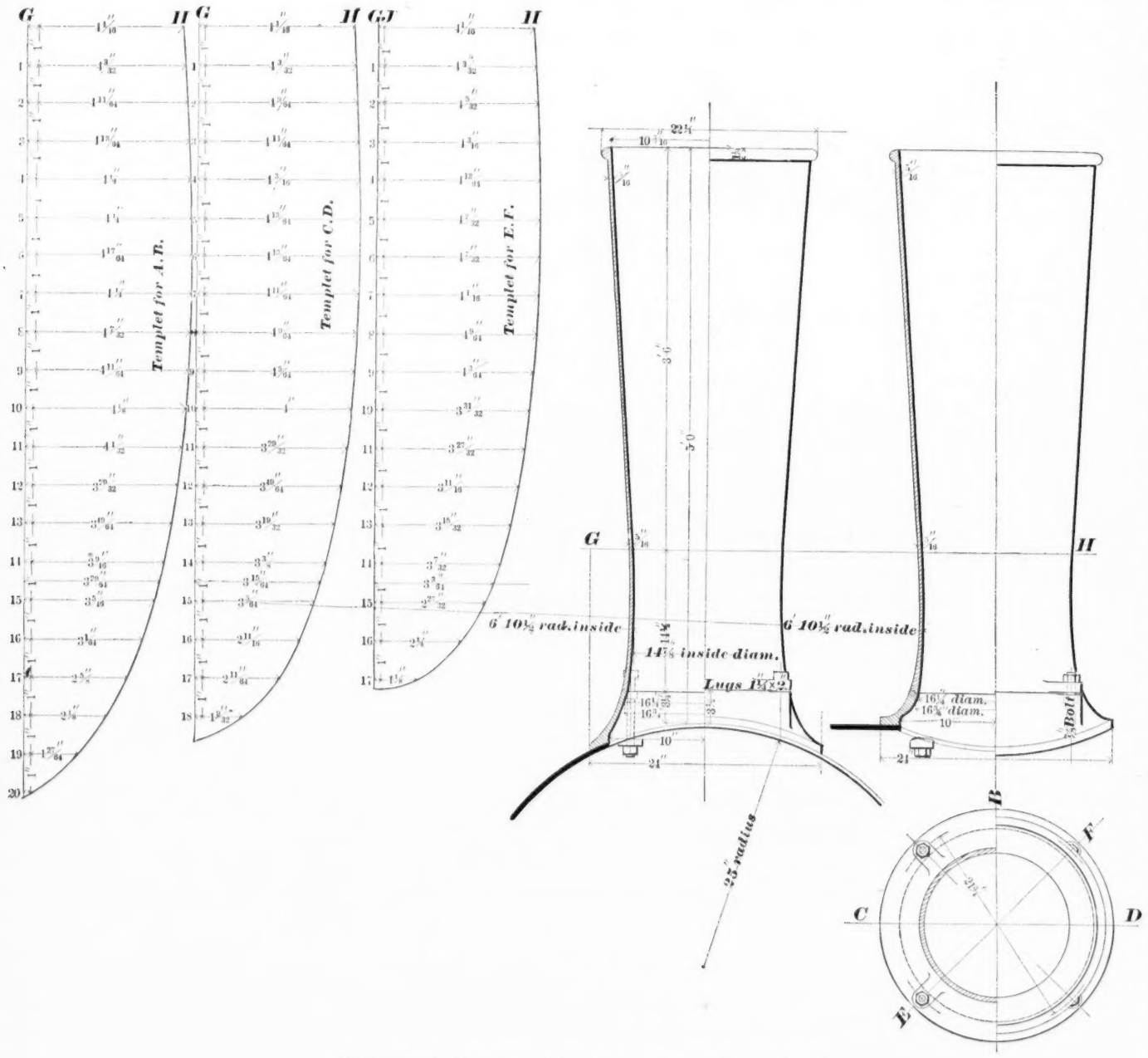
I send you blue print of the cast iron smoke stack with which this company is replacing the old sheet-iron stacks as fast as they cut out. As you will notice, the stack consists of a barrel made in dry sand, and a base made in green sand. The core for the barrel is swept up on an iron barrel, using hay rope and loam. We find no difficulty in making perfectly smooth castings $\frac{5}{16}$" thick, and sometimes they run thinner.

The weights are: Base, 85 lbs.; barrel, 345 lbs. The cost of stack and base is about $12, being much less than that of the sheet iron stacks with cast iron bases and tops.

The 18" engines using them steam very well, but we have not put a water gauge on the smoke box to find how the vacuum compares with that of the 18" straight stack.

R. D. Wade, Supt. M. P.

Richmond, Va.



Richmond & Danville R. R. Co.'s Cast Iron Smoke Stack.

Sawing Staves for Core Boxes.

Editor American Machinist:

To your correspondent, "D. W. H.," who, in your issue of July 18, page 6, criticizes my article on "Short Method of Working Out Large Core Boxes," I would respectfully state that, notwithstanding the fact that clamping the straight-edge at an angle of more or less than 90° will produce an elliptical shape, I still assert that *staves* can be hollowed out to fit any circle from diameter of saw down to practically nothing. Core boxes are seldom or never constructed of less than three staves to the half box; consequently, that part of the saw projecting above the table is required to shape only one-sixth of the entire circle. That it does this practically true is no theory, as I have used this method for the last seven years, and "D. W. H." may prove the same to his own satisfaction by actual trial.

Frederick Leu.

Greenpoint, July 11, 1885.

Sunday Work—Does It Pay?

Editor American Machinist:

If it can be demonstrated to those who employ labor that Sunday work does not pay, that it is not only demoralizing, but expensive, and worse than needless, Mr. Hobart can easily win converts to his cause. Having superintended the construction of the present factories of a large concern, moved the machinery and men into them, and for twenty years got along without Sunday work, with remarkable freedom from stoppage for repairs, I am bound to say that it is far more economical and much more satisfactory to plan, arrange, and make repairs by daylight and on week days. Sunday work is but another name for extravagance and shiftlessness.

We require that notice shall be given to the foreman about all belts that need taking up or repairing; also of needed repairs to machinery. Men are provided who, at the stoppage of the engine at noon or night, stand by the side of the belt which needs taking up, and do the work; no machine is suffered to lie idle or wait in consequence. When the workman returns, he finds the belt has been repaired. If the main belt to the engine requires this attention, the clamps are brought alongside, every arrangement being made beforehand, and the task is soon accomplished during the dinner hour, or at the close of the day. The wearing-out of a machine can always be provided for with a little care, and, if properly attended to, the liability to breakdowns can be greatly lessened.

We have a 14x42 Corliss engine with condenser, working up to 150 horse-power indicated, which for 13 years has been no exception to this rule. It cost us last year $130 to bore out valve seats and replace the valves, and that represents the total cost of repairs on that engine during its 13 years of constant service, with little night or extra attention, no Sunday work, and perfect immunity from breakdowns.

The man who is always tinkering with things is a nuisance. Let well enough alone, but have "well enough" the maximum of excellence. In a large shop, where every workman repairs the machine he runs, mends his own belts, with no responsible head to attend to repairs, Sunday work is a part of the price which the owner pays for stupidity. A well-organized shop, in which systematic attention is given to the property used in and about the establishment, ought to embrace in its system the question of repairs, which, instead of being constantly on the increase, can be reduced to a minimum from the start. If left to take care of itself, like the house that is swept only once a year, or the man who only washes or changes his clothes every Spring, the matter of repairs becomes a big job when finally taken in hand.

The way to get rid of Sunday work, I repeat, is for those who have it to do, to demonstrate to the owner the expense and nonsense of the thing, and let the foreman arrange a system of administration that does not require it.

Levi K. Fuller.

Estey Organ Works, Brattleboro, Vt.

Tinning and Babbitting on Cast Iron.

Editor American Machinist:

As it is often desirable to tin cast iron for the purpose of uniting babbitt metal solidly with the iron, especially where only a very thin sheet of babbitt metal is wanted to make a bearing, I will describe a plan that I use, which proves very satisfactory. I have tried different other recipes given in books, which proved unsatisfactory, and were exceedingly unpleasant, owing to the acids used in trying to clean the surface of the iron, and the subsequent scouring with sand and rinsing in water; then the trouble, further, was the quick removal of that water (which, if not done quickly, will allow the surface to oxidize) before applying the muriate of zinc. If the water is not removed before plunging into the tin bath, any man

who has had experience will know what the result will be as to the action of the molten tin, and the surface will also be very unsatisfactorily tinned, and will not—at least, did not for me—answer the purpose.

The work that I use this tinned surface on is a rather long sleeve made in halves, which, owing to their thinness, requires a very thin lining of babbitt metal; and the babbitt metal, to be satisfactory, has to be solid to the iron, so that it will not drop out. This babbitting makes a cheap substitute for boring these half collars, which would require considerable labor and expense.

The plan which I adopted was as follows: I have a pot arranged in a furnace, in which I have the tin bath in a molten state. The castings I clean by a sand-blast process. To do this, I made a sheet iron box, and fixed a pipe into the top of it on an angle backward. In this pipe, on the outside of the box, I have a lifter or siphon made on the ejector principle, to which I connect a hose to a cask or box below, containing sand and water. (I tried different kinds of sand, but found the pewter or silver sand the best.) Now, by turning on the steam of about 80 or 90 pounds pressure, and stirring the sand and water, it is lifted by the ejector and blown violently into the box on an angle backward, so that it will not blow out by rebounding when striking the casting. By a suitable holder the casting is now held, and moved back and forth and from side to side underneath this jet of steam, sand and water, and the process of cleaning the casting is quickly and very satisfactorily done, as the sand, by the blast, cuts the cast iron like a file, and that in the very corners, and presents a perfectly clean, white iron surface, free from dross, oxide, scale, or whatever. Now, after this is done, the surface is somewhat dirty from the sand which has lodged on it, which is objectionable. To clean this before removing the casting from the box, I draw the hose out of the sand and water box, which then allows only steam to pass out of the jet, and this will thoroughly cleanse the casting.

Now we remove the casting, and as it is very hot it will dry in an instant; then, with a small brush I apply the muriate of zinc quickly (giving the surface no time to oxidize), and immediately plunge it into the tin bath, without any danger of having a shower of tin thrown over me, and the casting, after leaving in a short time, comes out nicely and perfectly tinned. It tins quickly, because the casting is already very hot when put into the tin bath.

The bottom and back of the sand-blast box must be lined with wood, which can easily be replaced when nearly cut through, for without this the sand would soon cut a hole through the box. The sand and water returns to the cask by an opening in the box below, and the steam escapes through a pipe connected to a chimney with good draft.

Now, the process I have for babbitting this work is to have the babbitt metal melted in a pot same as used for the tin bath. I have my form over which I do my babbitting heated up to a temperature nearly equal to melting the babbitt metal. The babbitt metal I heat so that it will run freely without making it too hot, and keep it covered with charcoal dust to prevent loss by oxidation. I heat the casting by plunging it into the babbitt metal a short time, to get the temperature nearly to that of the metal, and place it on the form, and with a small ladle I dip out the metal and pour, and the result is a thin sheet of genuine babbitt metal solid to the casting, and as smooth as the form or mould is itself. Thus, by repeating the operation of babbitting, it will be seen that the form always remains hot, and insures every one being a perfect job. The babbitt thus run is only $\frac{1}{16}$" to $\frac{3}{32}$" thick. Thinking this process might be of value to some of your readers, as I found it valuable to myself, I give it to all those who may have use for it.

A. B. Landis.

According to U. S. Consul General Swann, St. Petersburg, the Russian beet-sugar refining companies made smaller profits in 1884 than in 1883, but one company declared 20 per cent. dividend, another 8 per cent., another 15 per cent., and still another 20 per cent. for the year 1884.

What I Know About Jigs.

By S. W. Goodyear.

I know that for many years I have been familiar with the use of certain tools, templates, devices, and fixtures, sometimes improvised from pieces picked out of the scrap heap, or from the promiscuous lot of odds and ends which will accumulate wherever machinery is built, or hardware is manufactured. Sometimes these were made with the utmost care, by the best man in the shop, from carefully considered plans, which fully encompassed every minute detail, thoroughly anticipating the end from the beginning, and consuming days, weeks, and even months of time in the production of little pieces, which might have been carried for safe keeping between-times in the pocket, without being burdensome.

Jig or Gig; which? A hunt in dictionaries and encyclopedias shows that we have been utterly ignored, as well as the woodworkmen who use jig-saws. No definition which I have been able to find, carries with it the faintest shadow of a hint at the uses to which we put this wonderfully useful indispensable shop tool which we call jig. It is to be hoped that, sometime in the future, through some revision or new publication, we may have justice at the hands of authors of dictionaries and encyclopedias, and that the author of the next Complete Practical Machinist will include jigs among the many tools described. What is it? It is of too multiform shape to be described as a drill, tap, reamer, hammer, or other simple tool may be described. It is anything by the use of which pieces of metal may be filed to some exact shape, the jig acting as a pattern by which to file, and by being hardened, limiting the progress of the file to its own shape. Jig filing was much practiced in the early days of gun-making.

As a boy, I remember looking with admiration at long lines of neatly-aproned, stalwart, intellectual-looking men who did the jig-filing at Springfield armory, and whose every motion, from the long, steady stroke of the file to the dainty tap with which the accumulation of chips were knocked out at intervals, as the teeth of the file were in danger of being clogged, filled my boyish heart with envy. No short, jiggering motion about the way those veterans shoved a file. No uncertainty as to the plane in which the file must travel to come down on to the hardened surface of the jig on both sides of the piece which was being filed simultaneously, and when to stop, for it was necessary, of of course, to file clear down to the jig to insure the shape, while every stroke of the file on the hardened jig wrought ruin to some of the teeth. Masters of their trade those men seemed to me *then*. No less *now*, when it is likely that they all have ceased from shoving the file, and most of them have "shuffled off this mortal coil." Between two hardened pieces of steel, the outline of which is exactly what the piece is to be filed to, the two pieces being fixed in a way with dowels or guides, which insures their entire parallelism, triggers, lock plates, hammers, and other gun work, with all sorts of small pieces for other uses, may be filed by the thousand, each piece to be like every other of its kind. I find myself meditating upon how this useful tool, the jig, originated; and while, as is well known, the American Machinist is not given to publishing romance, but confines itself, generally, to the plainest facts, it strikes me that I may be permitted to repeat here what my imagination tells me may have been the fact as to the origin of jigs.

Looking back through the dim past, (how is that?) I see a man, with file in hand, in the act of filing down a piece of iron or steel to a line, which has been carefully placed exactly where it is desirable, if not necessary, that the cutting with the file shall stop. He finds it extremely difficult to stop at just the right point. If part of the line is left, it is hard to tell whether the filing stopped at the center of the line. If the line is all filed out, it is certain that the filing went too low; but, how tell how much too low? The man is in trouble. Ah! He sees a way out. He screws the piece in the vise, with the line to which he wishes to file just even with the top of the hardened vise jaw. The back jaw, for the vises in use then were of the variety in which the back jaw was fixed with its face in a vertical position, while the front jaw, being attached to an arm which was pivoted to the upright standard, about half way from the jaws to the floor, met the work, with which it came in contact at varying angles, depending upon the thickness of the work. Now he has it. He files down till his file strikes the vise jaw, and it's just the thing; only he has to be extremely careful about carrying his file exactly level. Now appears another man, who invents the parallel slide vise. This gives a cue to the whole thing; but, only straight lines can be filed with the hardened vise jaws for a jig, and as pieces multiply which need to be filed just like a pattern, jigs are made. That jigging machines which use rotary cutters instead of files, and guide the cutter in cutting a *fac simile* of a pattern used, by a follower going around the pattern, just as the cutter must go around that which it cuts, or that gangs of mills bring to shape under the manipulation of mere boys the pieces which were most difficult for the most expert jig filers, need not detract from the merit due to the inventor—whoever he may have been—of filing jigs. They are used yet, even to the using of the parallel vise jaws.

But it is not filing jigs, perhaps, which your readers wish to know about. In the building or manufacturing of machinery, and in the manufacture of hardware in general, there are many holes to be drilled, which must occupy, as nearly as possible, some fixed position, leaving the distance, when drilled, from some other hole or holes, or from some edge or edges, uniformly alike as between all the pieces of the same kind Jigs to bring this about are in such common use in some shops as to raise the question why there should be anything said about them; and still there are shops in which no jig has yet made its appearance, where, if it once gets a foothold, it will be considered indispensable.

What is a drilling jig? Anything in which hardened steel bushings may be set, fitting the drill to be used, and in such a relation to each other where several holes are to be drilled, and in such relation to the general outlines, or to some particular edges or parts of the piece to be drilled, as to locate with accuracy the position of the hole or holes, standing in place of laying out.

Most of us who have had experience in "laying out" and drilling holes, which needed to occupy some exact position, will be willing to testify very positively as to the extreme uncertainty attending that method. First comes the difficulty of laying out correctly; and, next, of drilling exactly by the laying out, after which follows the not delightful uncertainty whether we have accomplished what was undertaken, for there are many jobs in which the *doing* in a way which *must* bring right results, beats any subsequent inspection all hollow.

What shape is a jig? All shapes. Any shape which may be put into, on to, under, over, or in any way attached to the pieces to be drilled in some regular uniform way, so that, no matter how many pieces of the same kind may be drilled, there is a certainty that from some fixed points on the pieces the holes all occupy the same position of distance and direction. Jigs are made by which simply one hole is to be drilled. Others are made by which many holes are to be drilled, sometimes all from the same bearing, or all in the same plane, sometimes in many different planes. Sometimes all the many holes may be of the same sizes; oftener they will be of different sizes. Sometimes many spindle drilling machines, each spindle carrying same size of drill required for some hole, obviates the necessity for either changing drills, or removing the jig, till the drilling is complete. Sometimes all the different-sized holes must be drilled with one spindle, involving a change of drills for each change of size, or, the removal of the jig as each piece has a hole drilled, each piece to have the jig replaced upon it for further drilling.

Whether drills, or jig, shall be shifted is, or should be, settled by the question: Which consumes the most time? Is it certain that the jig can be put on always exactly the same? These questions bear upon most vital points. The application of the jig to, and its removal from, the work quickly, are of great importance, and herein lies the great difference between different men in "getting up" jigs. Of two men who will make jigs to drill some certain piece, it may often be said of one, "it takes longer to put his jig on and take it off, let alone the drilling, than it would to lay out, and drill the holes," while of that made by the other man, doing its work just as well, and each doing it perfectly, is said, "don't take any time, can put it on and take it off while we would be finding out where to mark with a prick-punch for one hole." And, as to being able to put the jig on to the same piece twice alike, or any number of times, why, that involves the very foundation on which the whole system rests—theoretically—but, in practice, with the facts that drilling chips are not always brushed from bearing points, that keys, screws, cones, levers or other holding devices are not always brought to bear under the same pressure, I would advise that the jig be left on, in one position, when possible, till all the work be done.

Jigs may be fastened to the work which is to be drilled by them in various ways. Thumb screws, or nuts, which may be turned with thumb and finger where this gives sufficient power, or screws, or nuts provided with levers attached, where thumb and finger are insufficient, are in many cases advisable as saving time, which would be used in picking up and laying down wrenches. Pivoted straps to be swung into and out of position by simply loosening a screw, instead of taking the screw out, and screwing it in; cones or eccentrics which clamp by a simple turn of a lever; wedges which by driving to position through mortises in studs by a tap of the hammer, or, as in many cases, by striking with the weight of jig and attached work on the bench, or on some conveniently placed piece of metal, hold just as firmly as screws, and save much time. These are only some of the devices which the fertile brains of jig-inventing mechanics have brought out.

Invention? Yes, in hundreds, aye, in thousands of cases, has the obscure mechanic made inventions in this great drilling-jig field, involving more real inventive genius than has been displayed in some inventions which have made the fortune of the inventor, and blazoned his name to the world. And still when the grimy hand of the machinist turns out a jig in obedience to the direction of his own busy brain which reduces the cost of drilling 25, 50, even 75 per cent., and at the same time insures uniformity, who thinks of it as invention? It is simply a good job. But, I have already written so much that I shall have to defer till I write again what I started to do, *i. e.*, make a jig on paper for the enlightenment of the uninitiated who read the American Machinist. Of course, machinists know all about it, but, hoping that they will forgive the intrusion, I hereby agree to hunt out a representative jig, and show it up for the benefit of those who don't know.

A South African Industrial Exhibition.

American Consul Siler writes to the State Department, from Cape Town, South Africa, that an industrial exhibition will be held at Port Elizabeth, South Africa, from December 10, 1885, to January 10, 1886. Class 57, of the machinery exhibit, admits agricultural machinery suitable to the wants of South Africa, wherever made. Class 59 admits machinery specially adapted to South African wants (such as machines for boring purposes, raising water, and diamond cutting and polishing), wherever made. Applications for space must be made to the secretary before November 10, 1885, on forms obtained from him. All applications must be accompanied by a remittance for the charge for space required (1 English shilling per square foot up to 100 square feet). The address of the secretary is Fred. Levick, Port Elizabeth, South Africa.

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☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those especially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, AUGUST 1, 1885.

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Sticking to Prices.

Competition has become close in the machinery business, and we hear frequent complaints about cutting prices. A manufacturer sometimes whittles his prices down to "hard-pan," where he can just pay expenses, including interest on his investment. Then some buyer offers him about five per cent. less for a few machines that he has ready for shipment. Suppose he wants the ready money that is offered to pay current bills, what will he do? If he yields, not only is there "no money in it," but he helps establish a vicious system. When cutting of legitimate prices begins, it is hard to tell where it will end. The working machinist gets his wages cut, and is told that the business yields no profit, and that the shop might as well be closed. The same kind of competition is practiced by other establishments to the injury of everybody interested, and for the benefit of nobody. The only safe way is to settle upon fair prices for machinery, and stick to them. Cutting prices won't increase the number of jobs done. It will lead to the use of poor stock and botch workmanship. The buyer will suffer as well as the manufacturer. It is a policy that works to the loss of everybody concerned in the transaction. In a recent conversation with a builder of machine tools, he mentioned to us an instance of great pressure to cut his price. The machine wanted was in stock, and a price was named which the manufacturer knew was not high, but which would afford him a profit. The buyer asked for a cut, declaring he could buy cheaper of another manufacturer. Finally he made an offer, and, not content with a refusal, counted out the money, and urged the manufacturer to accept it for the machine. Although it was but little less than the price at which the machine was offered, the manufacturer stood firm, and refused to accept a cent less than his full price. His position is the correct one, and the sooner all machine manufacturers reach the decision of fixing a price and adhering to it rigidly, the better it will be for the trade.

Against Sunday Work.

In directing public attention to the question of Sunday work in shops, Mr. Hobart, while calling out a number of communications sustaining his condemnation of it, does not seem to have stirred up any defenders of the system as yet. It might be thought that, if it had any defenders, they would be found among employers. In another column we publish a letter from Colonel Fuller, superintendent of a large establishment—the Estey Organ Works—taking ground against Sunday work, from the employing point of view, quite as radically as does Mr. Hobart.

The bow that is always bent loses its spring, and the man or the manufacturer who never rests is only likely to form an apt illustration of the value of the old commandment, "Six days shalt thou labor and do ALL thy work."

We observe that the often-disregarded commandment nowhere contains a codicil which sanctions fixing belts, repairing engines, or doing extra jobs on the seventh day. If a day of rest was needed in those quiet times of several thousand years ago, is it not far more necessary now, when men and events so crowd upon each others' heels?

The Case Fairly Stated.

Every able-bodied convict in every prison or penitentiary or jail, should be furnished with work enough, at least, to make him earn the cost of his own subsistence, no matter what happens outside of the prison to anybody else.

The above, which we copy from the Jersey City *Evening Journal*, is the most candid expression of the sentiment in favor of the prison contract system we have yet seen. The *Journal* deserves the thanks of everyone interested in the matter for setting up the defence fairly—divesting it of the usual stock phrases that never deceived anyone, and were cheap in every sense. Those who oppose working prisoners in direct competition with free labor, do so on diametrically opposite grounds, viz.: that it does matter what happens to those outside, so the issue is fairly taken. There may be those who will contend that the argument of the *Journal* is brutal; none will deny that it is frank. And from its side of the question it is entirely logical. The advocates of the contract system generally set up a straw man, assuming that those opposed to enriching some favored contractor at the expense of fairly conducted manufacturing interests, are in favor of maintaining prisoners in idleness. There is not a representative manufacturer or workman in the country who does or ever did advocate this. But there are thousands who believe that it does, to quote the *Journal*, "matter what happens outside of the prison to anybody else;" who believe that, in common with prison contractors, and with prisoners, *honest* men and women outside of prison walls have some rights. To them we commend the argument, for the first time squarely stated by the *Journal*.

Increasing Suburban Traffic.

Some of the leading railroad companies are shortening their time-tables between cities hundreds of miles apart, to a degree that would have been considered impracticable not very many years ago. Taking a broad view of the subject, and considering how the habit of travel grows with increased facilities, there can be no doubt that their action in so doing will lay the foundation for an enormously increased traffic in the future. But while this problem of shortening the time-table between great cities is being pushed to such rapid solution, why should not all railroad companies, whose lines radiate from or pass through such cities, recognize the fact that right at their doors they have a profitable field of business activity, which is capable of almost unlimited development, namely, suburban traffic? Railroad men may say suburban traffic "does not pay," but if it does not, it is because the conditions which make for its increase, both in volume and percentage of profit, are not properly recognized by railroad men. The saying that "God made the country, but man made the town," is doubtless true; but in these days of railroading, man can also do a good deal to make the country in the neighborhood of large cities desirable as a place of residence.

The fact that so many people, whose business employments are in the city, prefer to live in the country, as things now are, shows how immensely the volume of such traffic might be increased, with a proportionate increase in the percentage of profit. Too many roads now appear to be mindful only in such matters of the immediate present. Too many roads appear to think the least facilities suburban residents will stand, without rising in revolt, the proper measure of accommodation to be furnished. Too many roads appear to consider the money aggregate of this year's passenger fares as the only thing to be considered in laying out time-tables.

Faster trains and more of them, are what dozens of suburban neighborhoods now need, for the steady filling-in of a great population, with all the varied wants that population implies.

We have in mind more than one rural neighborhood, possessing special advantages for sure and speedy growth, whose express trains are so arranged that nobody can live there, without great discomfort, except the small class of business men who can afford to get to their business as late as 10 o'clock in the morning. Unmindful that these same residents would naturally be able to go home at a correspondingly early hour in the afternoon, the railroad now condemns residents in one such neighborhood within our knowledge, either to loaf around an hour or two each day waiting for an express train, or to go home 312 days in the year in a tedious "accommodation." In a word, the present policy of the railroad company drives away a very much larger number of possible patrons, and does not adequately serve the small number it now has.

Let it be understood that bringing towns and neighborhoods, now 15 to 40 miles away from the city, to within practically half or two-thirds that distance, in point of time and service, increases the mileage of the road, in effect, without need of watering its stock.

The mechanical problem involved is one that can be readily solved. More express trains, drawn by engines of the Forney or other type suitable for speed and quick starting, a fairer division of express train facilities among the stations on each line, and more frequent trains generally, with time-tables which have some reference to possibilities of future growth, form the outlines of the needed policy. In building up suburban towns and neighborhoods, the railway companies interested must take the initiative.

One Kind of Mechanical Progress.

A contributor writes that our recent notice of *Mechanical Progress* tallies exactly with his impression of No. 1, Vol. I., of "that English selection of American articles." He is doubtful, however, whether that kind of "mechanical progress" is quite as inequitable as the habit some journals have of stealing his articles from the AMERICAN MACHINIST, while taking pains to credit them wrongfully to another journal.

Relating to another phase of the same subject, an American machinery manufacturer writes us:

We sold to a firm in Aberdeen, Scotland, one of our patent key-seating machines, in September, 1883. We obtained the patent on March 20th previous. The party buying it (a large concern) took it over, made patterns, and are now making the machine under a patent granted them in January, 1884. It is as perfect a machine of my make as the ingenuity of a Scotchman could make it. It is the same in every particular, and they use every one of my claims, which are six in number. We have the specifications and drawings of the patent granted them.

E. Gould & Eberhardt, of Newark, N. J., write us: "In your issue of July 11th, in Questions and Answers (No. 208), a question is asked in regard to magnet steel, to which you reply that you know of no such steel. Mr. Carl F. Boker, 86 John Street, New York, is agent for a firm who make "special magnet steel." Jas. F. Hotchkiss, of 86 John Street, New York, also writes us to the same effect.

A good deal of discussion is going on in the daily press with reference to the delay to railway cars and trains from draw-bridges. The delay is frequently vexatious, but it is a dangerous experiment that is proposed, viz.: that the draws shall be opened to suit the convenience of the railways. The right to navigate navigable streams is one that should be jealously guarded by the people, for reasons too obvious to need repetition. Those who are engaged in navigating such waters already have reason to complain of the delay and danger of draw-bridges, and have more right to demand that bridges be raised, or crossings be made through tunnels, than railway corporations have to demand that navigation shall practically cease whenever they may elect.

An Interesting Relic.

The crank-shaft of the famous Confederate cruiser, the Merrimac, is lying in the yard of the Haxall & Cranshaw Mills at Richmond, Va, the proprietors of these mills having bought the shaft with the intention of using it in their machinery. After the vessel was sunk the machinery lay in the water for several years, but the hull was recently raised and the iron-work disposed of as junk iron. The crank-shaft bears deep evidence of its immersion in the water of the Chesapeake Bay, for it is badly pitted with corrosion. The shaft is 27 feet 4 inches long by 15 inches diameter, and shows evidence of rather crude workmanship. It appears to us that this important portion of the machinery of a vessel that played a celebrated

part in the naval history of the late war ought to be worthy of preservation. A naval and railroad annex has recently been added to the Smithsonian Institute for the purpose of preserving relics relating to naval and railroad history. If the propeller shaft of the Merrimac would not be a proper relic to place in a museum of this kind, we would like to know what kind of relics are wanted.

Not a Good Time to Migrate.

The best opportunities for a mechanic, if he is a good workman, are, generally speaking, where he is best known. It is a good plan for a young mechanic to see something of more than one shop, and more than one section of the country, but he should not let the traveling mania get too firm hold of him. Machinists, in particular, seem quite commonly impressed with the idea that *somewhere else* there are big wages and a good time generally awaiting them. Every mechanic should get as good wages as he can, but when the difference in the cost of living is taken into account, there is, as a matter of fact, but little difference in the real value of wages paid in different parts of this country. Nor is it likely, when business is dull in any considerable section of the country, that there is abundance of work at high wages in some other section. Not infrequently a mechanic will throw up a good job on the probability of finding something better "in the West," or "in the East," as the case may be, and spend the savings of two years in getting work at less wages than he left. If he is not appreciated where he is known, how can he expect to be where he is not known?

The above may be taken in reply to letters we receive every week, asking about the probabilities of getting work, at better wages, in various localities. The tenor of these letters bears out the assumption that the location where plenty of work and better wages are expected is simply somewhere else—that is, the letters come from nearly every State in the country. The present time—any time, in fact—is a good one for mechanics to stay wherever they have work and fair usage, unless they leave on a direct assurance of something better.

Literary Notes.

THE WINDMILL AS A PRIME MOVER. By Alfred R. Wolf, M. E., etc. New York: John Wiley & Sons, 15 Astor Place.

Notwithstanding the windmill is one of the oldest of prime movers, there is but little literature relating to it, and that little is so scattered through different publications as to be scarcely available. If in this volume nothing had been done except to collate this literature, putting it in form to be come at for practical purposes, it would have been a work of undoubted value. But the author has devoted a good deal of time to the study of his subject, and has been professionally engaged in a capacity that necessitated investigation, the results of which he gives.

In the first pages of the work mathematical formula is extensively employed; this will be appreciated by the engineer educated to its use, and the results being tabulated, the non-professional reader will find the information he seeks without paying much attention to the formulas.

The chapter on "The Early History of Windmills," although not presented as embracing much that is new, is decidedly interesting, and the only fault the reader will be likely to find with it is its brevity.

The chapter on "European Windmills" is equally interesting, and with the full illustrations given, is particularly valuable.

Three chapters are devoted to "American Windmills," which contain illustrated descriptions of a large number of machines.

Chapter IX. treats of "The Capacity and Economy of the Windmill," and will be found of more value to those who may be desirous of using this motor than any that have preceded it.

The concluding chapter of the book is devoted to data and tables of value to every engineer, and especially so in connection with windmill practice.

The matter is clearly and pleasingly written, and well printed on good paper. The price is $3.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(220) J. E F., asks: Should you call the head of a horizontal stationary engine through which the piston-rod runs, the front end? *A.*—Yes.

(221) J. K, North Andover, Mass., asks: Will you give me a good mixture for babbitt metal? *A.*—You will find this in Questions and Answers column of AMERICAN MACHINIST of April 21, 1883.

(222) S H, Springfield, Mass, writes: My fire pump throws a jerky stream. I have tried a larger air chamber, also put air chamber on suction, but that does not help it. It is a horizontal steam pump; lifts the water 12 feet. Can you suggest any remedy? *A.*—We can only suggest that a small suction pipe may bring about the action you mention, or a slight air leak, or improper action of valves

(223) W. F. W., Bristol R I., writes: I use a good many mandrels, which I wish to harden their whole length. I have tried many ways, but the mandrels will spring. Can you suggest a remedy? *A.*—You cannot expect to harden the mandrels without springing them a little, after which they must be ground true and to size. The best plan we know of for heating and hardening is the one given in Questions and Answers, Jan. 17, 1885.

(224) T. S, Worcester Mass., writes: I have a ⅜-inch pipe connected to a boiler which carries 60 lbs. of steam. I use the pipe to heat water and vitriol for scaling castings. Can you tell me what it costs for fuel to supply that pipe when I use it for ten hours? *A.*—No. An engineer accustomed to making such calculations, could determine by experiment about the cost of supplying the pipe; anything else would be guess work.

(225) J., Lynn. Mass., asks: What do you think is wanting for a good draught for a boiler, under the following conditions: 48 tubes, 15 feet long, 1⅞″ diameter; grate surface, 3x4½ feet; grate 16″ inches from boiler: combustion chamber 3 feet from brick to boiler; flue leading to boiler 14½ feet long, 18″ diameter; chimney 16x24″, 50 feet high? *A.*—The opening through tubes is not sufficient to burn a bright fire on more than half the grate you use; your chimney is too low for very strong draught.

(226) W. W., Ensival, Belgium. asks: Is there a practical way of putting figures in relief on cast-iron patterns, so they will come out in the casting? *A.*—There is no trouble whatever in doing it. The figures can be obtained of dealers in such supplies, and soldered to a brass plate, which can be fastened by screws to the pattern. The brass piece can be let in flush with the surface of the pattern, if it is desirable that the letters only stand out from the pattern. Another, and, we think, a better plan for making the plate is, to cut out the brass and attach the letters with shellac, then take this to the electro-platers for a plate.

(227) S. T., Des Moines, Iowa, writes: 1. Mean effective pressure is the pressure above counterpressure urging the piston forward. Now, what is counterpressure? I say it is the resisting pressure above atmosphere, resulting from restricted exhaust passages, etc. My friend says it is the resistance of the atmosphere. *A.*—Counterpressure is the resisting pressure above a vacuum. In a non condensing engine it is made up of the pressure of the atmosphere and the resistance the steam meets with in its escape from the cylinder. In a condensing engine it is made up of the pressure in the condenser and the resistance to the escape of steam. In a non-condensing engine it is customary to measure the forward pressure above atmosphere, and to speak of the back pressure as the resistance above atmosphere.

(228) R. H. W., Charleston, S C., writes: I am running a 10″x20″ slide valve engine, 106 revolutions. When a heavy machine is thrown on, the engine pounds very badly for a minute or so; when I slack up and start off it also pounds. I put a line through the cylinder and found everything in line and level; pillow-blocks are perfectly solid. Can you tell me what the trouble is? *A.*—Your trouble is not an uncommon one. As you are ordinarily running compression is probably higher than terminal pressure, and gradually reverses the strain at the end of the stroke. When the heavy machine is thrown on, the work of getting it up to speed puts so much work on the engine that the terminal pressure is higher than compression, the result being pounding. If we could see diagrams from the engine, taken when it was and was not pounding, we could give a better opinion. The presumption is that if you can get inside lap on the valve, so as to close the exhaust earlier in the stroke and secure more compression, the pound may be stopped. It may be that compression would then be too high, that is, above steam-chest pressure when running comparatively light. The best way to judge of this is from indicator diagrams. Sometimes changing the lead, trying it more or less, will improve the running.

Business Specials

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Katzenstein metallic packing, 169 Christopher st., N Y

Curtis Pressure Regulator and St'm Trap, July 4, p 15

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co., Bridgeton, N J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Consulting Engineer and Mechanical Expert, C. C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st, New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Send for new catalogue of tools for amateurs; just out. Hartford Tool Co., Hartford, Conn.

Improved Labor-Saving Upright Drills: prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Light, fine, interchangeable mach'y to order. Foot lathe catalogue for stamp. E O. Chase, Newark, N.J.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C E., New Haven, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Largest and best portable forge on the market, $10 each. American Tool Co., Cleveland, Ohio.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large; prices low. Frasse & Co., 62 Chatham st., N. Y.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent on orders for five or more copies.

Manufactures.

Rome, N. Y, is to be lighted by electricity.

Ishpeming, Mich., is to have the electric light.

Prouty & Co. are interested in a company which is to manufacture water filters at Spencer, Mass.

The Russell Pump and Engine Co., Southington, Conn., has been incorporated. Capital, $30,000.

W. W. Boyington, Chicago, is architect for a factory building for Crane Bros., to cost $45,000.

The Iowa Economic Heater Co., Marion, Iowa., has been incorporated with $60,000 capital stock.

The Central Railway Shops are to remain at Corsicana, and are to be enlarged.—*Brenham (Tex.) Banner.*

The Dayton Coal and Iron Works, of Dayton, Tenn., will erect a steel plant as soon as they have completed their furnaces.

The Hopkins Mower Company is to manufacture mowers at Croton, N. Y. A number of prominent New York City men are incorporators.

Joseph Loth & Co., 333 West 22d street, will erect a 3-story silk mill at 150th street and 10th avenue, New York City.

The Straight Line Engine Company, Syracuse, N. Y., say they are busy on engine orders, but Prof. Sweet thinks they could do more.

The Seymour Paper Company, Seymour, Conn., will erect a paper mill to replace the one recently destroyed by fire. Estimated cost, $10,000.

At the Montana Iron Works, Foundry and Machine Shops of Ferrell & Thirloway, Butte City, Montana, the first run was taken off on July 2, 1885.

The Detroit Machine Screw Works, whose works were heavily damaged by fire June 19, 1885, have again started their machinery, and are now in good running order.

Francis H. Easby, Lehigh ave. and Mutter street, Philadelphia, has started the manufacture of 16″ engine lathes, and is now building two extra buffing heads to special order.

The Covel Machine Company, Fall River, Mass., has issued a circular of their friction geared portable and stationary engines. They build these engines in a variety of forms and styles.

The Carteret Mills, Beaufort, S.C., have started to build a foundry 20x50, and a machine shop 30x60. Foundry building will be built of corrugated iron, from the Porter Roofing Co.

The Glen Manufacturing Company, of Berlin, N. H., has bought a large water privilege on the Androscoggin River, which will be improved. A mill will be erected for the grinding of wood pulp.

Public Works Commissioner Carr, of Jersey City, wants a city machine shop at Belleville, as parts of machinery now have to be sent continually to Newark for repairs. Says $3,900 will be required for a 40-inch swing lathe and an engine.

P. A. Whitney, of Chagrin Falls, Ohio, has removed his tools to Warsaw, N. Y., and taken an interest in the Variety Machine Co. of that place, who will hereafter manufacture his ratchet and geared drills and other special tools.

The National Chuck Co., Port Chester, N Y., has been organized to succeed the National Mfg. Co., of New Haven, Conn., in the manufacture of the "National" chuck. W. C. Young is president, R. Y. Shadbolt secretary, and J. C. Stevens superintendent.

Samuel T. Williams, machinist, of Baltimore, is now moving into a building two stories high, 18x70 feet, with large yard room, where, with increased facilities, he expects to turn out more and better work. He now has orders to build several 25-horse-power engines for parties in that city.

The German-American Optical Company, of Frankfort, Germany, are erecting extensive works, and will use American skilled men as foremen, and the most improved American machinery in their works. They have purchased an American engine—the Ball Automatic—to supply their power.

The Taunton Locomotive Works have changed the exhaust pipes of the engines they build with extended smoke boxes, so that one is behind the other, instead of being set side by side By this means less obstruction is offered to the gases passing from the tubes toward the smoke stack.—*Railway Review.*

According to the Baltimore *Manufacturers' Record*, the first half of July has developed marked activity in the starting of industrial enterprises in the South. It predicts that, if the large cotton and corn crops are produced which now seem almost certain, the South will show wonderful industrial activity this fall.

It is said that Morrison, Colwell & Page will, in the near future, erect a rolling mill on Simmons Island (Troy, N. Y.) The proprietors of the Island contemplate building a dam at a point immediately south of the bridge leading to the Island, from which water-power will be obtained for the operation of the mill. *Troy Evening Standard.*

Watson & Stillman, 468 Grand Street, New York, manufacturers of hydraulic jacks and presses, keep two or more presses, with power pump, at all times standing ready for use in experimental work, pressing embossing rolls, forcing on cranks, pressing in crank-pins, or similar work, and provided with gauge to tell pressure up to 600,000 lbs.

According to *New Enterprises*, new boilers will be put in by Cowdrey & Co., 80 Broad st, Boston; Plymouth Water Works, Plymouth, Mass., and Charles T. Speer, Rockland, Me. The State prison, Jackson, Mich., is to have a new boiler house and two new boilers. The celebrated Tewksbury Almshouse, at Tewksbury, Mass., will have three new boilers, and a chimney 100 feet high.

The citizens of Dover, N H, are at work raising funds to secure the location of a $25,000 machine shop in that city. This is the right policy to pursue. Raising a bonus by enforced taxation, and exempting private property from taxes for a term of years, are neither just nor wise movements. All manufactories employing help should benefit a town, and there is no good reason why one should receive a bonus which taxpayers are compelled to pay, than another.

A New Haven firm have purchased 300 barrels of brass millings which have accumulated at Torrey's foundry, Bath, Me., in the past three years. These millings are from the skimmings of the molten brass before it is poured into the mould, and contain more or less dirt. The dirt is washed out and the finer millings separated from the coarser by sifting. The price paid was $6 a barrel, which will, according to *The Independent*, allow the purchasers a profit of about $1,000.—*Industrial Journal.*

Horace Thurston, Providence, R. I., has brought out a screw machine of a new design, which, although occupying less than three feet square of floor surface, will cut 19,200 screws in a day of ten hours, as we are informed. The whole top of the machine revolves, and at each revolution 8 screws are automatically threaded and extracted. The machine makes four revolutions per minute, thus cutting 1,920 per hour. The screws cut at this rate are 3-16″ diam. and ⅞″ long on thread. The machine is entirely automatic in its action, requiring only the screws to be placed in a hopper. It was built after designs by Geo. S. Rider, who is connected with Mr. Thurston's establishment.

The Aldermen of Chicago, Ill., at their meeting July 7, passed a resolution appointing Aldermen Clark, Ryan, and Noyes a committee to act with the Mayor and Commissioner of Public Works on obtaining new and larger pumping engines for the North Side works. The committee will advertise for bids and award contract for the engines.

A company has been incorporated to supply Wilkesbarre, Pa., with water. A pumping station will be established at Campbell's Ledge, with a large main branching off to supply several other towns and collieries. Estimated cost, $1,000,000 Corporators are Irving A. Stearns, A. H. Dickson, W. M. Shoemaker, Ex-Gov. Hoyt, and others.

Machinists' Supplies and Iron.

New York, July 16, 1885.

The supply business presents no new features for comment. Sales are in amount about the same from week to week, and prices remain unchanged. Manufactnrers are accumulating but little stock, curtailing production to meet the demands.

Iron—The market for American Iron continues dull, and prices rule in favor of buyers. There is little prospect of a change until the wants of consumers increase, as users consider prices unsettled, and will not buy beyond immediate needs. Quotations should be taken as representing asking prices, rather than the prices obtained in actual transactions. It was thought that recent reduction in price would stimulate demand, but this does not seem to be the case; on the contrary, buyers seem to expect further concessions, as a matter of course. In prices we quote No. 1 Foundry, standard Lehigh brands, $17.50 to $18; No. 2, $15.50 to $16; Grey Forge, at furnace, $13.50 to $14.

Scotch Pig—Very little is doing in Scotch brands of iron. We quote Shotts, $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18 50 to $19; Gartsherrie, $19.50; Summerlee, $19 to $19.25; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19 50 to $20; Dalmellington, $18 to $18.25.

Copper—There is no improvement in the demand for copper. Lake is quoted 11.10c. to 11.15c., and other brands at 10¼c. to 10⅝c, but buyers are bidding less, and are not disposed to pay asking prices.

Lead—The market is firm, and holders are inclined to look for an advance. Sales have been at 4.05c. for common. Advances in price in London have materially strengthened the market here.

Spelter—Refined, 8c. to 8⅛c.

Tin—The market is strong, with a tendency to advance prices. This is owing mainly to a corner here. We quote jobbing lots of Banca 22c; Straits and Malacca, 23c. to 23¼c.

Antimony—Hallett's, 9c.; Cookson's, 9½c., with fair demands.

WANTED

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Position wanted as foundry foreman; good references M. E. Chanic, Am. Machinist.

Steady work desired by first-class machinist; best references. Box 759, Penn Yan, N. Y.

Wanted—Situation as foundry supt. or foreman. Best reference. Address Founder, Am. Machinist.

Situation as foreman of machine shop; good references given. Address Buckeye, Am. Machinist.

Charge of drafting room wanted by responsible man lately engaged at erection of sugar house. Address Ability, Am. Machinist.

Boilermaker of large experience desires an engagement as foreman; best references as to ability, experience and character. Address Flanger, Am. Machinist.

The Ottumwa Iron Works, of Ottumwa, Iowa, wish to engage a foreman for their foundry, to take charge of about 25 moulders; castings to be made are mostly such as are used in mining machinery.

If you are in need of a good mechanic as foreman or superintendent, a worker, who has served successfully as above, would take an inferior position, if there was a chance to work up. Address J. D., Am. Machinist.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion.

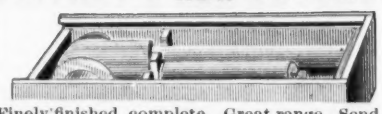
Crescent Boiler Compound; ever reliable, never failing. Crescent Mfg. Co., Cleveland, Ohio.

Wanted—Second-hand planer, in good order; about 6″ x 8″ x 20″. Address 28 Ave D, Bellevue, Scranton, Pa.

To make room for larger tool, will sell cheap, for cash, a planer 42″x42″x12′, in good order. Address P. O. Box 2085, Bridgeport, Conn.

A Manufacturing Co., with the best facilities for doing foundry and machine work of medium weight, would like to correspond with parties who require such work. Address X., Am. Machinist.

WHITNEY'S NEW RATCHET.



Finely finished, complete. Great range. Send for circular. VARIETY MACHINE CO., Warsaw, N.Y.

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177 & 179 Washington Street, BOSTON, MASS.

Of all kinds in Stock and Made to Order.

Estimates Furnished for Model or Light Machine Work.

Tools and Supplies for Machinist and Manufacturers.

Send for Catalogue B.

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For Hard Coal or Coke. Indispensable in all shops to keep **Bradley's Cushioned Hammers** and men fully employed and reduces cost of production.

BRADLEY & CO. Syracuse, N.Y.

SPECIAL NOTICE.

All parties making, selling or using an Upright or Helve Power Hammer having a Cushioned Vibrating Saddle, infringe our patents, and we shall hold them legally liable for the same.

BRADLEY & COMPANY, Syracuse, N. Y.

SEBASTIAN, MAY & COMPANY'S Improved Screw Cutting

Foot or Power Lathes

Catalogue of Lathes, Drill Presses and Machinists' Tools and Supplies mailed on application. **Lathes on Trial.**

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THE BROWN HAMMER

STRIKES A BLOW WITH

DOUBLE THE VELOCITY That it Raises the Hammer.

A NEW MOVEMENT! SEND FOR DESCRIPTION.

KNOWLTON MFG. CO., King St., Rockford, Ill

The Fireman's Guide.

A Handbook on the

CARE OF BOILERS

By KARL P. DAHLSTROM, M. E.

Crown 8vo, Cloth, 50 Cents.

E. & F. N. SPON, 35 Murray St., New York.

STEPHENS PATENT PLANER CHUCKS

Self-Adjusting.

Combine valuable features offered by no other tool. In range of opening; advantage of self-adjusting jaw worked by a single screw; graduated base, etc. Parts interchangeable. Chucks guaranteed. Sold by the trade. Send for Catalogue.

MELVIN STEPHENS, Prop't. Office, 41 Dey Street, New York.

FOR SALE AT A BARGAIN.

A well established and good paying machine shop and foundry, including buildings, lots, machinery and stock, situated in Leadville, Col. The business will be carried on until sold, thus at once giving a profitable trade to the purchaser. Address,

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Care of Dickson Mfg. Co.,
Scranton, Pa.

Only reason for selling, ill health.

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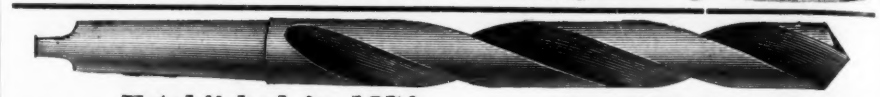
Send for Catalogue.



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The Beaudry Upright Power Hammer,

Was awarded the medal of the

FIRST CLASS,

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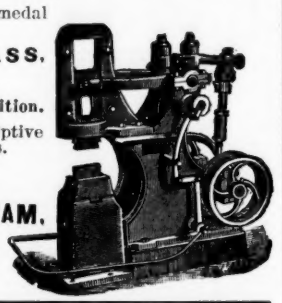
Send for descriptive circular and prices.



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A first-class Foundry, nearly new, and a Machine Shop, capable of employing two hundred and fifty men, in a desirable location, where wages are low, will be let on favorable terms; or, an arrangement made to manufacture some special article, the party controlling which can act as General Manager or Superintendent. An excellent chance for a party to introduce a new manufacture or enlarge an old one. For further particulars, address,

Post Office Box 733, Providence, R. I.

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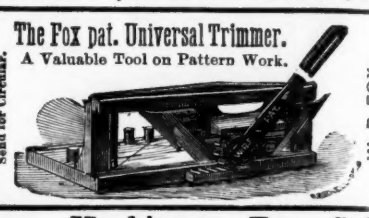
The Fox pat. Universal Trimmer.

A Valuable Tool on Pattern Work.

CUTS SQUARE or ANY ANGLE. Send for Circular.



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New Machinery For Sale.

VERY LOW.

1 Engine Lathe, 18 in. x 6 ft.
1 " " 15 in. x 8 ft.
1 " " 12 in. x 6 ft.
Drill Presses, 18 in., 22 in. and 24 in.
1 16 in. x 6 ft. Speed Lathe.
1 16 in. x 6 ft. " " with milling attachment.
1 Iron Frame Saw Table, for 14 in. saw.
1 4 in. One-side Wood Moulder.

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EXPERIMENTAL WORK CAREFULLY BUILT.

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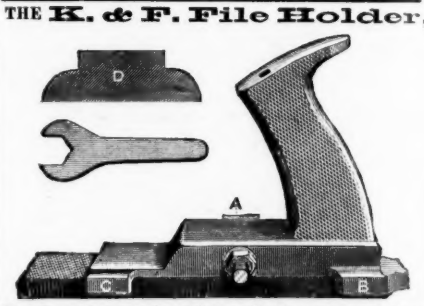

For surfacing work, either with file, emery cloth or sand-paper. Quickly adjusted. Of great service in machine shop, cabinet shop or tool room. Price, $1. Circular mailed on application.

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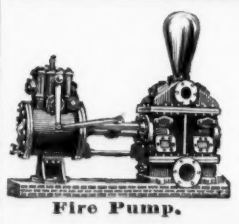

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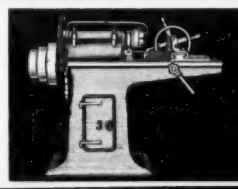

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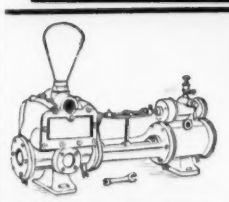

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Mr. JOHN C. BLEVNEY, Pres.,
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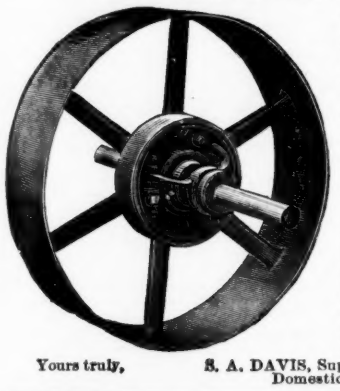

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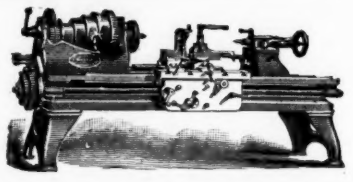

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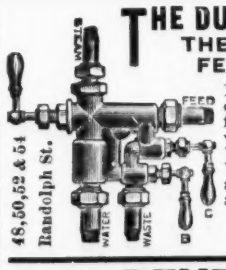

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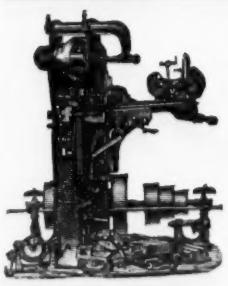

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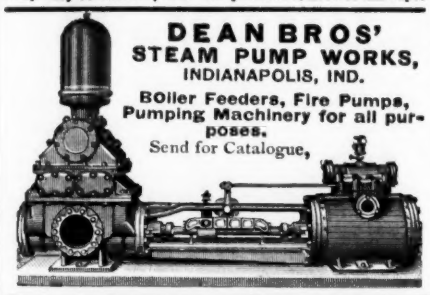

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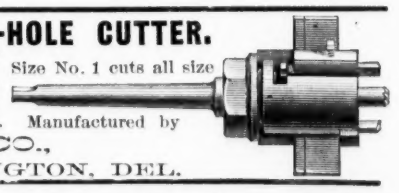

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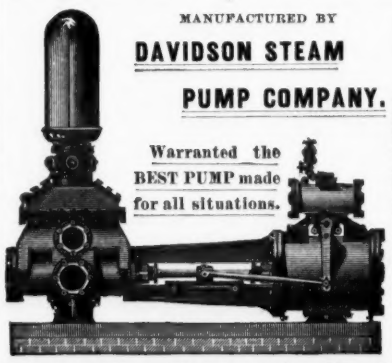

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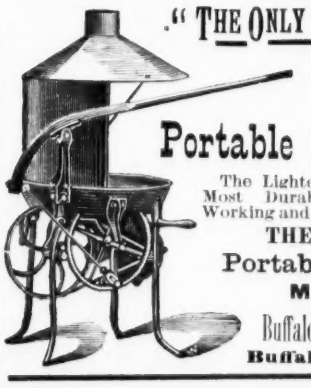

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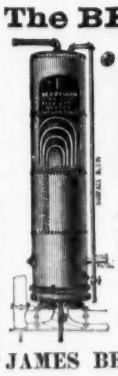

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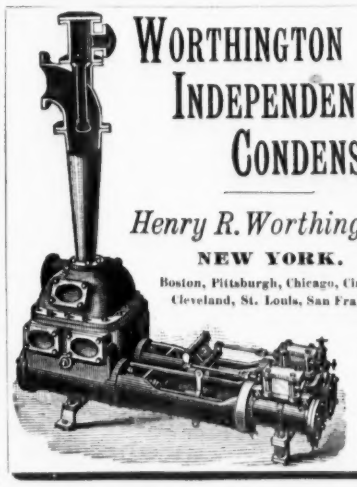

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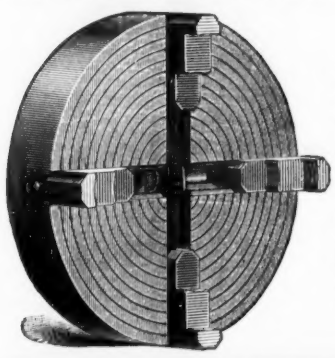

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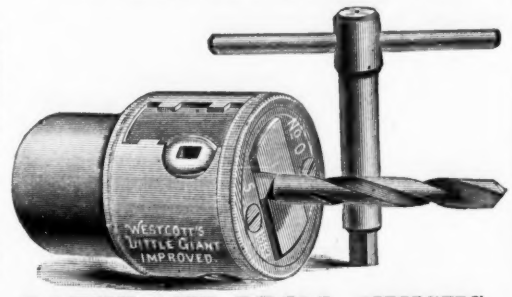

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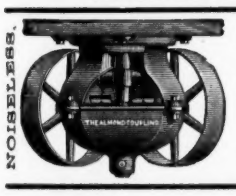

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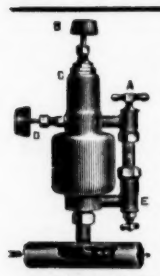

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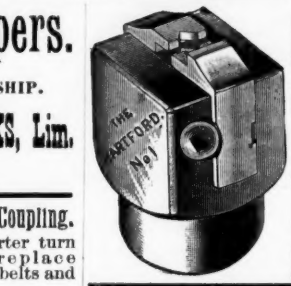

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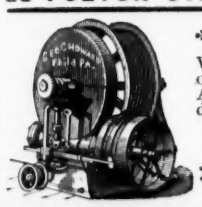

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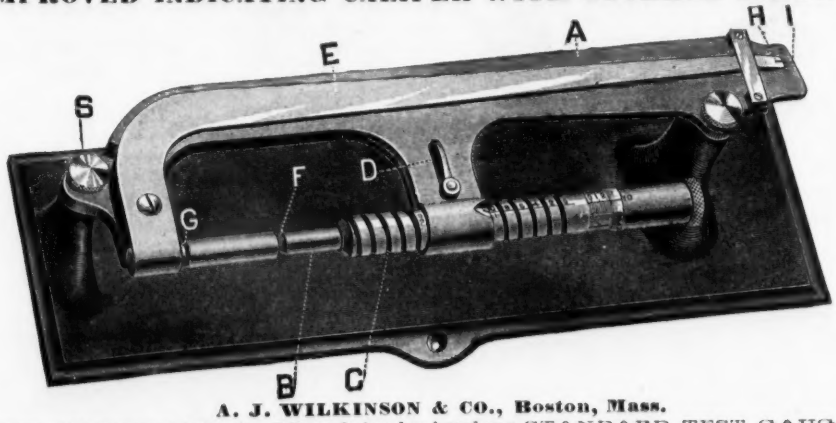

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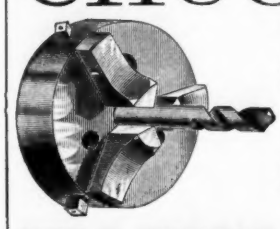

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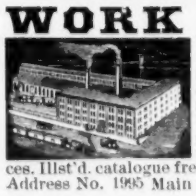

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Indicator Diagram, The. February 9, 16, 23; March 1, 8, 15, 22, 29; April 5, 12, 19, 26; May 3, 17, 24; June 21; July 5, 19, 26; August 9, 23; November 29; December 20, 1884; February 7, 28, 1885

A. H. Mathesius.
Power Needed in Operating the Cable Road on Brooklyn Bridge. January 3, 1885

Jno. C. Trautwine, Jr.
What Is Centrifugal Force? April 5, 1884
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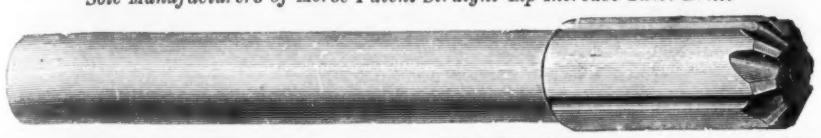

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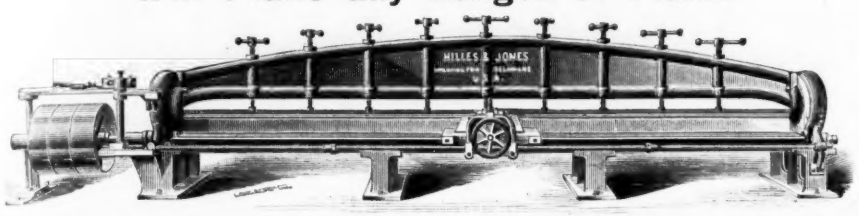

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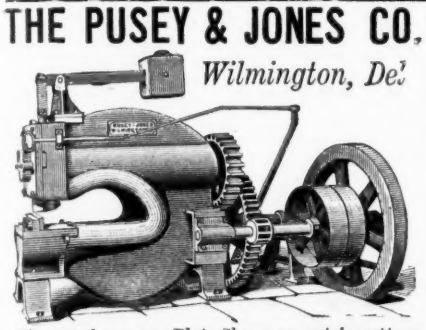

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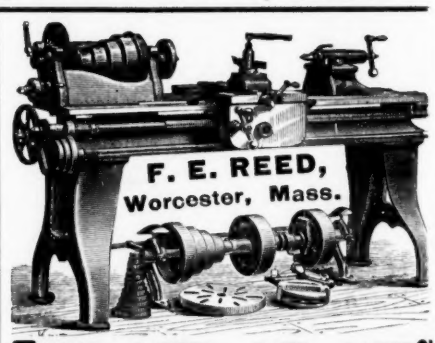

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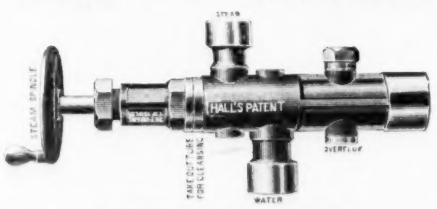

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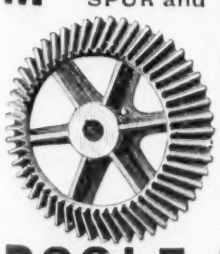

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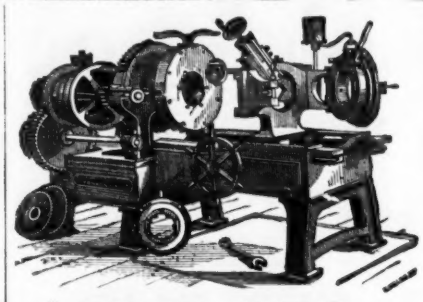

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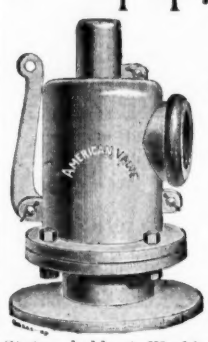

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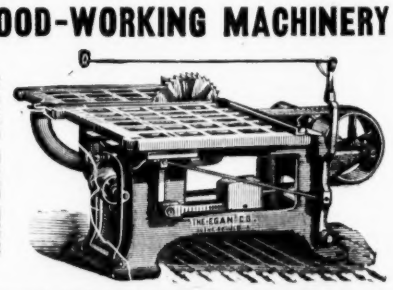

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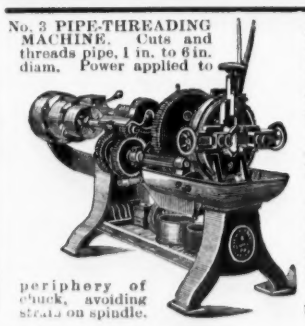

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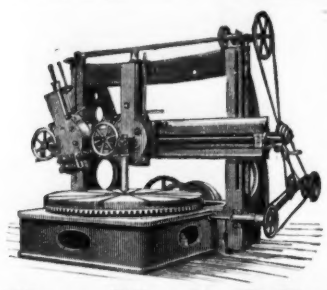

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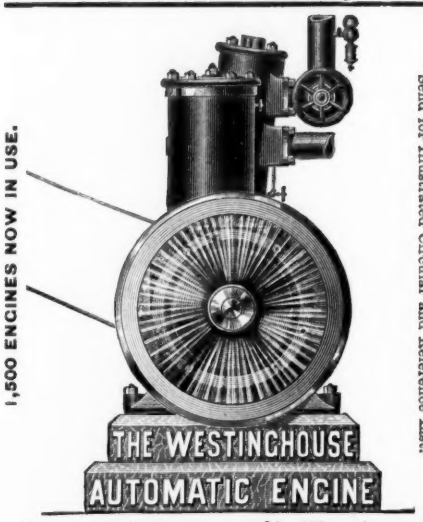

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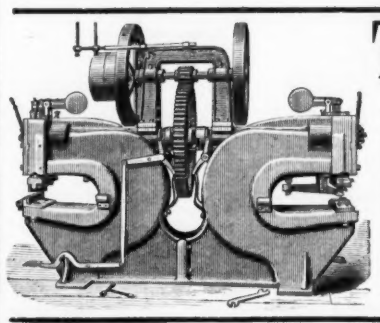

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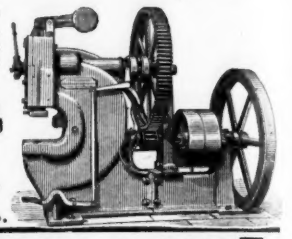

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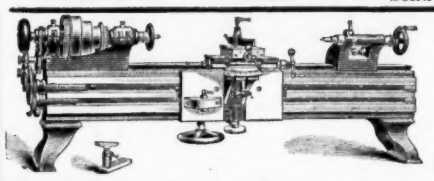

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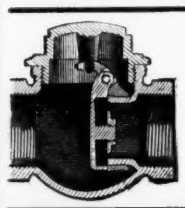

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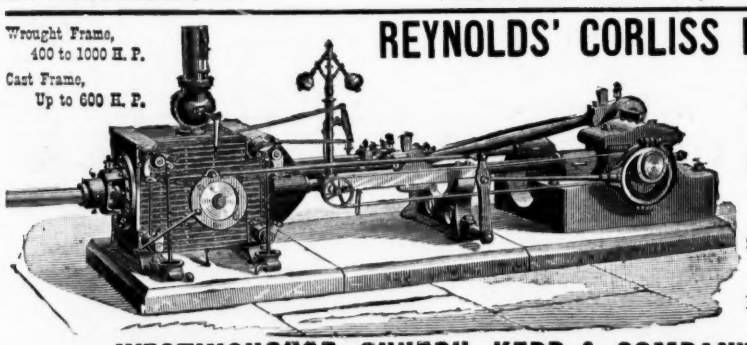

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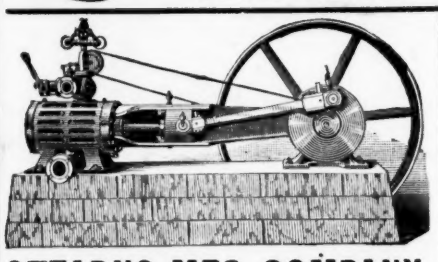

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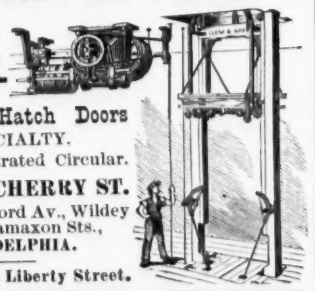

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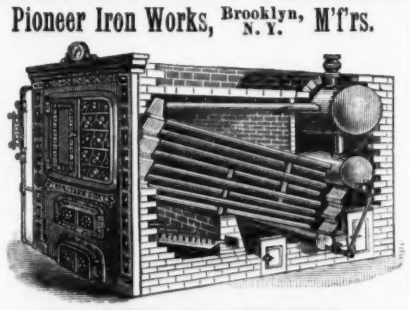

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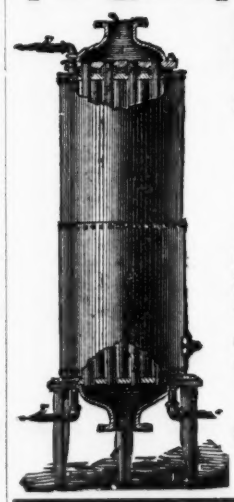

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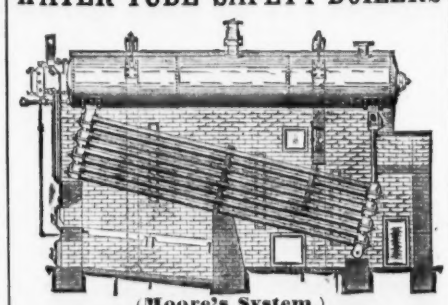

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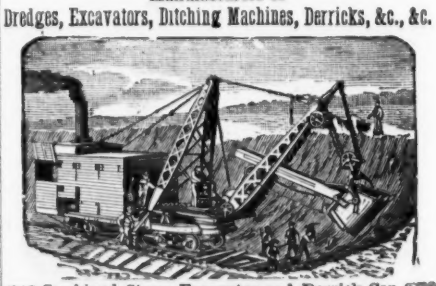

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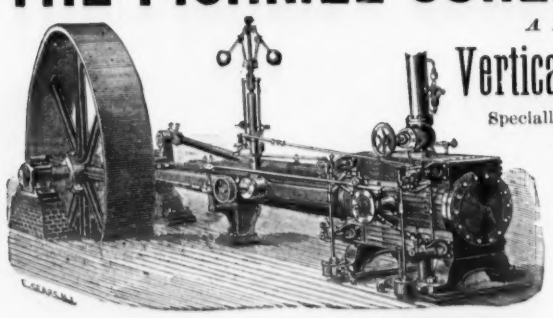

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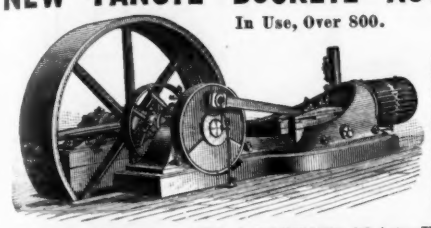

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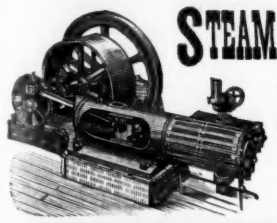

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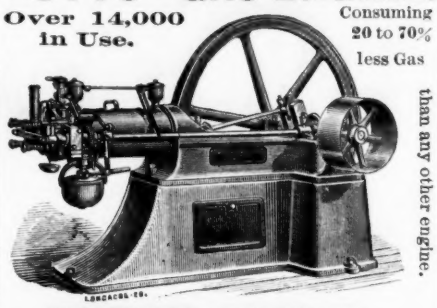

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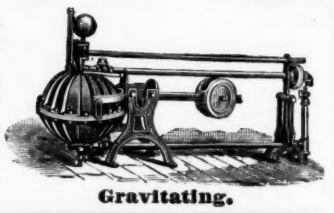

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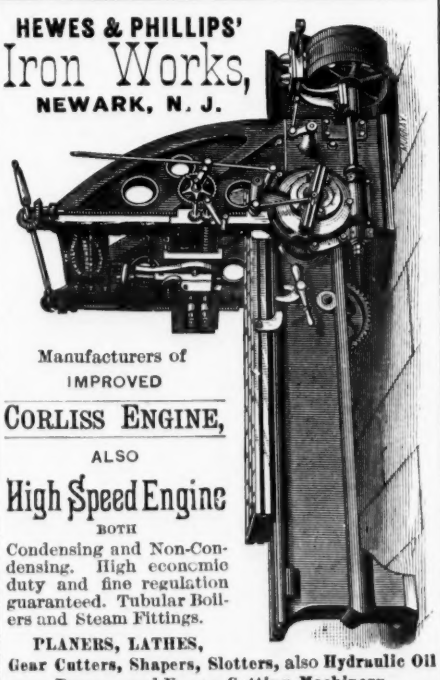

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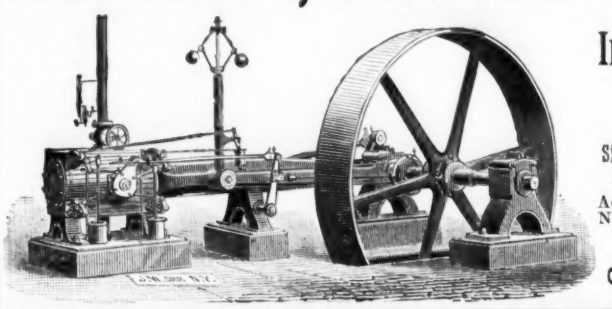

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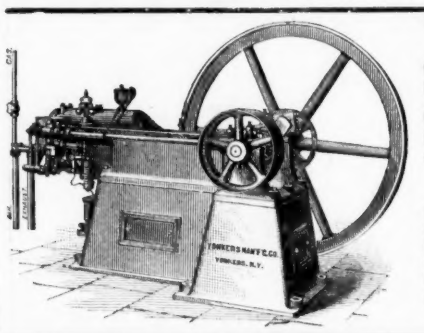

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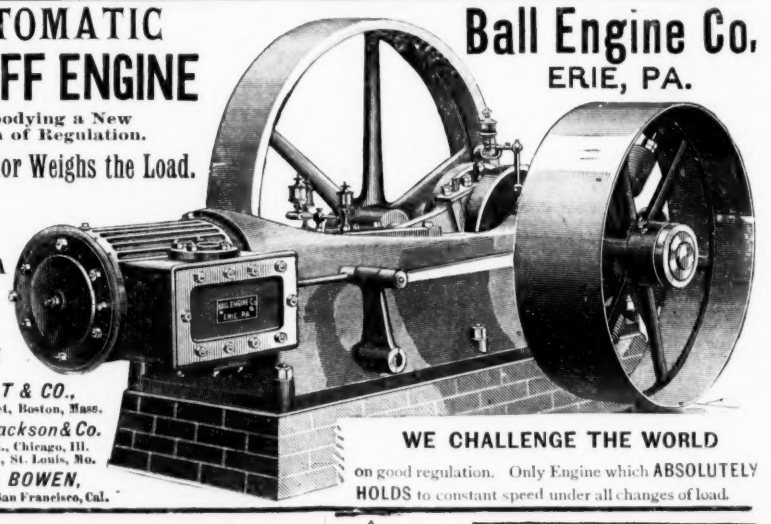

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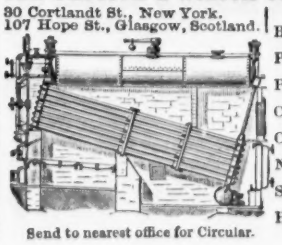

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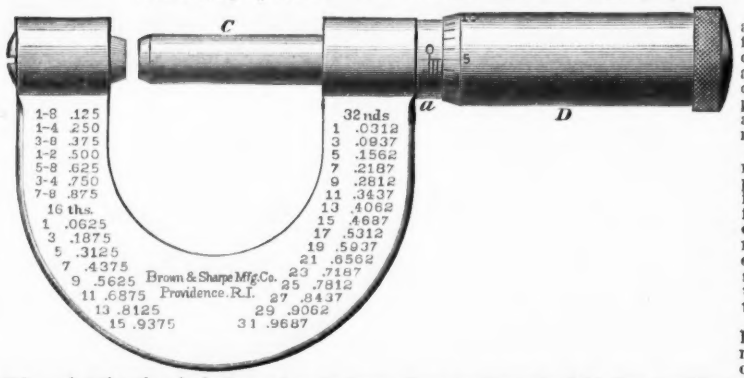

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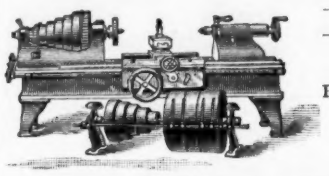

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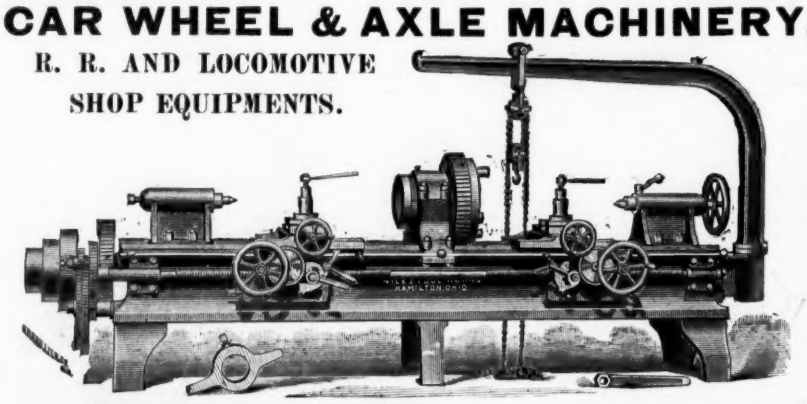

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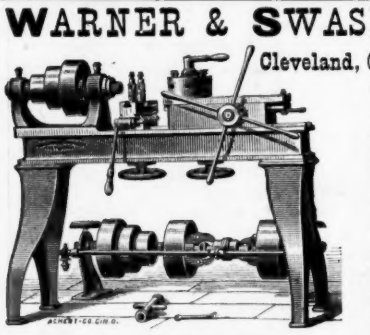

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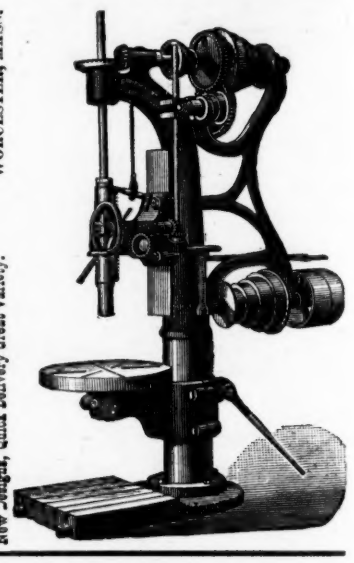

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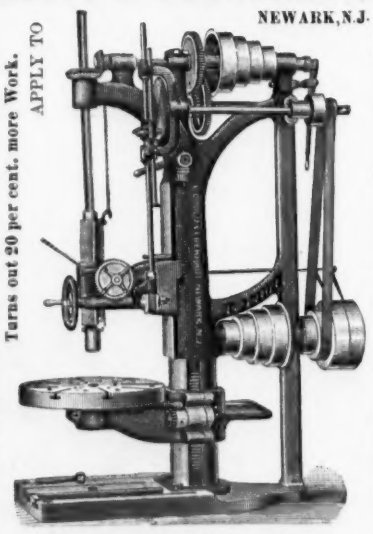

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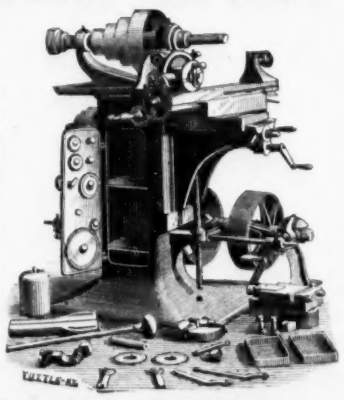

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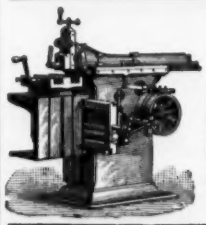

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